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Articles contributed to Medical Journals.

BY

JOHN D. GIMLETTE,
M.R.C.S., L.R.C.P.

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1895–1909.

BY

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LONDON:
HARRISON AND SONS, ST. MARTIN'S LANE,
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THE QUEEN OF PORTUGAL'S DISPENSARY AT LISBON.

Her Majesty Dona Amelia, Queen of Portugal, stands foremost amongst the reigning sovereigns of Europe as a promoter of philanthropy and as a practical worker in the field of medicine. The interest taken by her in the treatment of diphtheria by the antitoxin method has already been noticed in the *British Medical Journal*. Through the kindness of Dr. Mello Breyner, Physician to Her Majesty, it was my recent privilege to visit the charming little dispensary at Lisbon, known by the name of "Dispensario de Sua Majestade a Rainha," which privilege was subsequently graciously extended by the Queen herself.

This building, like the "Gibert" Dispensary at Havre—described in the *British Medical Journal of* January 12th—is devoted to the treatment of diseases of children. The dispensary is personally managed by the Queen, who is accustomed to visit it regularly and to assist in the dressing and treatment of surgical cases. On the occasion of my visit Her Majesty arrived in the early morning, attended by a maid of honour, and prepared to attend to the wants of the many starving sick Portuguese children assembled. Her gentle solicitude and ready sympathy to both children and mothers at once won the heart.

It is scarcely possible to exaggerate the wretched circumstances of the 2,000 children who have attended the dispensary since its inauguration on Christmas Day, 1893. The object of the institution—the only one of the kind in Portugal—is not only to satisfy the needs of children under 12 years of age in a medical sense, but to provide them with food, warm clothing, and baths.

The building, which has a very modest exterior, is at Alcantara, the chief centre of the manufactories of Lisbon, and is close to the Palace of Necessidades. It stands in a small garden, which serves as a playground for children in front and as a kitchen garden behind, while its windows command a magnificent view of the River Tagus. The entrance door opens from the garden into a waiting room, which is paved with tiles and provided with benches capable of seating about 50 persons. This communicates with the kitchen, which again opens into a light and airy dining room to accommodate 100 children, to whom free dinners of soup, meat, rice, etc., are given twice a day. Sterilised milk is also supplied. A small and richly-painted figure of the Virgin above the door of this room, as well as a finely-carved crucifix, serve as appropriate and natural ornaments for such an institution in this country.

The patients are received in a small, well-appointed consulting room on the first floor. A waiting room, provided with a balcony and with separate doors for entrance and exit, opens into the consulting room on one side and on the other into a well-lighted and ventilated casualty room, which is one of the largest rooms in the building. It is floored with concrete and the most perfect cleanliness is enforced. Two small operating tables of metal are fixed at either side, and facing one of them is a complete apparatus both for the sterilisation of surgical instruments and for the distillation and sterilisation of water. A tripod for the application of plaster-of-paris jackets to the spine, a screen, and the necessaries for antiseptic and simple dressings, douches, etc., complete the furnishings of the room. Surgical operations which do not require hospital treatment are performed here as well as dressings.

Adjoining is a small but well-equipped apothecary's department. The remaining apartments consist of a room fitted with baths and supplied with gymnastic apparatus, a small office, a pantry, and wardrobe. The sanitary arrangements, water supply, and ventilation are very good, and a carriage, provided by the Queen, is at hand to take such patients as require careful conveyance to their homes.

The honorary professional staff—Dr. Carvalho, who is the Medical Officer of Health for Lisbon, and Dr. Mello Breyner, a Court Physician—visit the dispensary on alternate days of the week.

Scrofula, chronic tuberculous disease of bone and joints, and ophthalmia form the bulk of the diseases treated. During the last year 500 successful vaccinations had been performed.

The nursing staff is under a trained sister of charity, who is assisted by eight others as well as by the ladies who bear the Queen company on her daily visits. It is little wonder that this small institution with its efficient staff of medical men and trained nurses, headed by a gracious and kindly Queen, has proved an unmistakable success, and the spirit of love and goodwill displayed in its management is by no means its least pleasant feature. — *British Medical Journal*, 1895, *Volume i.*, *page* 876.

"A QUEENLY STUDENT."

We recently mentioned that the Queen of Portugal has for some time shown a pronounced taste for the study of the healing art, and has been pursuing her studies with great assiduity, with the view to taking a degree. We are authoritatively informed that this is not the case. The Queen devotes a large portion of her mornings to philanthropic labours among the poor children of Lisbon, and takes a great interest in visiting her dispensary, established in Lisbon for poor children, of which we published an account in the *British Medical Journal* of April 20th, 1895. Her Portuguese Majesty was, we are informed, so much pleased with the report of the dispensary which we published that she had copies of the *British Medical Journal* containing it carefully kept in "capas." Her Majesty, however, has never even thought of studying medicine, still less of passing examinations, and her whole interest in the subject is one of pure philanthropy.—*British Medical Journal*, 1896, *Volume i., page* 291.

REMARKS ON THE ETIOLOGY, SYMPTOMS, AND TREATMENT OF LATAH, WITH A REPORT OF TWO CASES.

THE functional nervous affection which takes its name from a Malay word latah (nervous or ticklish) is of great interest, owing to its comparative rarity and very obscure pathology. A short residence in the ulu or interior of one of the vastest Malay States has afforded an unusual opportunity for making these notes.

CASE 1.—Timah, aged 44, native of Kelantan, midwife, was first seen on April 3rd, 1897, at Kuala Lipis, Pahang. The patient, a married woman, has had four children; two died in infancy. She could not tell much about her family history. There is apparently no evidence of latah, either in direct or collateral lines. Besides malarial fever and ordinary parasitic skin diseases—the usual afflictions of her race—she contracted syphilis some years ago. Menstruation is said to have commenced about the age of 10 years. It has now ceased. For some time—she could not say exactly how long—she has been latah. For the last two years she has complained of regurgitation of fluids from the mouth through the nose. She is a fairly well nourished woman with a natural expression. The chest is well developed, and the heart and lungs are normal. Pulse 80 weak. The knee-jerks are exaggerated; there is no ankle-clonus. The pupils are normal in size, and act to light. In the roof of the mouth are two small round holes in the middle line, one in the soft palate, the other perforating the hard palate. The palate is not otherwise deformed. During a quiet conversation and during her physical examination the patient responded readily to what she was asked, but appeared to be nervous about answering. On being suddenly startled by a loud exclamation she had a slight nervous tremor, and was henceforth completely latah for the time being. She could now be induced by the verbal suggestion of anyone present, supplemented by appropriate gestures, to laugh or cry, sing, dance, or pray alternately, and advance or retreat at will. For example, I told her to strike the inspector of police, who was sitting near me, and for whom she had great respect, whereupon she responded "Strike, strike," and struck him heavily in the chest several times. No other suggestion being at once offered she seemed to recover her senses instantaneously as it were, and carried her hands to her head, looking round with a perplexed expression, evidently not having been responsible for her previous actions. This quick recovery with the disconcerted attitude occurred many times during the intervals of the suggestions. Towards the close of this pitiable exhibition, which lasted about half an hour, the patient was gradually robbed of her power of self-consciousness and command. She invariably repeated aloud the suggestions offered to her, and not only imitated grimaces, however absurd, but mimicked different qualities of voice, and repeated strange English words with remarkable accuracy. On being handed a box of matches and told to eat it, the operator at the same time pretending to masticate, she had no hesitation in commencing and declaring it delicious; but on the suggestion of another person that it was pork, she readily threw the box away with an expression of great disgust. Upon being told that a tiger was in the room she exhibited no alarm; but it being suggested that it was about to attack her she also appeared ready to attack, although frightened. At last she was evidently becoming exhausted, and asked for a glass of water. The pulse was now 100, and she was trembling. When she had half finished the water it was suddenly suggested to her that it contained poison, and that she had better throw it away. She at once dashed both glass and its contents on the floor. On recovering her natural state, and being questioned quietly as to her conduct, she could give no explanation; she was good-tempered throughout. It was very evident to all the Europeans present that the exhibition had not been premeditated with the idea of causing either diversion or pity.

Case 2.—A Pahang woman, aged about 40, living near Kuala Lipis, was first seen on April 4th, 1897. The patient is married, and her youngest child is six months old. She is an advanced case of latah and no history can be made out on account of her persistent repetition of each question asked. She is supposed to have been latah for the last 15 years. She is a poorly nourished woman, and has a tired expression. The aspect is dejected, but her features are symmetrical. Her hair is turning grey. The heart and lungs are normal, the pulse weak, the knee-jerks are very brisk, and ankle-clonus can be readily produced. The eyes are normal, as is also her gait. She is garrulous, chattering to herself. On being startled, this patient acted just as the former case, but throughout she appeared to be frightened and anxious to retire. Repetition of the verbal suggestions was very noticeable. It being suggested, she nursed a felt hat as if it were her baby, even to the length of giving it the breast. On being assured, however, that it was only a hat she flung it down and assumed the perplexed attitude of the former patient. She showed concern at the suggestion and gestures of taking off her garments, but would have completely disrobed, nevertheless, if allowed to do so.

During the intervals of shock and suggestion she did not recover herself half so readily as in the case of the Kelantan woman. She was not so good-humoured either during her fit. The easy elicitation of ankle-clonus in this case recalls to mind the term "spinal epilepsy" which is sometimes used under other circumstances.[1]

Like many other affections, latah has probably existed for a long time before being recognised as a disease. Among the few published accounts in English, one of the most important is by Dr. W. Gilmore Ellis,[2] in which he recognises latah as a special disease. It is also described in a recent textbook by Dr. B. Scheube.[3] Other descriptions principally take up the symptomatology of latah. Amongst them is a graphic account by the Resident-General of the Malay States.[4] As regards this disease, in view of the absence of detailed statistics, only a general consideration of the relation of age, sex, heredity, religion, geographical extension and common facts can be gathered. In the majority of cases the symptoms seem to begin during middle life, and in women to be mostly pronounced at the menopause; at the same time, latah may appear earlier or later in life. It is more frequent in women than in men, but it certainly occurs also in the male sex.

There is no doubt that in this disease heredity has a great, though perhaps a not well-defined, influence. The transmission in an exaggerated form of a primordial Malay quality such as conservatism tainted by the influence of some old dormant superstition may be a factor in the etiology. The ancient superstitious faith of the Malays before their conversion to Mohammedanism still survives in their custom of ber-hantu. This witchcraft which has been described by Mr. Swettenham[4] is actually used by the native physicians in the treatment of sick persons. It bears an analogy to the religious and mystical element which pervaded the ecstatic disorders of the fifteenth, sixteenth, and seventeenth centuries, and which still prevails in the faith healing of to-day. Besides ber-hantu many exorcisms which the ear of devils cannot tolerate are commonly used by the natives of Malaya. The pure Mohammedan religion does not appear to have any influence in the causation of latah. It is the mixture of religion and superstition with the fearful belief in devils, familiars, and ghosts so common among the Malays which may have a constraining influence. The natural quality of imitativeness is well developed in the Malay mind. A morbid proclivity towards it must be an exciting cause of latah. The trick which latah persons have of verbally repeating the suggestions which they are about to carry out shows how deeply engraved this impression must be.

Hereditary antecedents such as syphilis, or any neurotic disease, do not seem to have any certain relation to the etiology. Consanguinity may have some influence, for inter-marriages are very common among the Malays themselves. It is not unlikely that children become affected through family association, and it is said that tickling them to excess will predispose them to become latah. Proof by tracing the life history of individuals is wanting to justify a conclusion. The children of acclimatised Chinese settlers who have inter-married occasionally become latah in after-life—that is to say, they are not born latah. It is said that Eurasians also more rarely become affected. Social position and hygiene appear to have no influence in the causation of this disease. Latah, it is true, is usually met with among the poor inhabitants of obscure native villages, but in Singapore and in the larger towns many cases may be observed. Although the hygiene of the village is not good, nevertheless a Malay never forgets the privacy, delicacy, and retirement almost generally observed elsewhere in satisfying the calls of Nature. A regular habit of body, and cleanliness at a neighbouring stream are among the principal rules of his life.

It seems to differ from the "latak" mentioned in *Quain's Dictionary of Medicine*[6] and the "lata" or "délire à Java" noted by Bordier,[6] in not being distinctly epidemic. The varieties are, however, manifestly akin. The geographical extension of genuine latah may be said to be confined to the Malay Peninsula and the East Indian Archipelago. This limitation suggests the idea that a humid climate may have some influence in the causation; but the apparent identity which exists between latah and the miryachit of Siberia[7] must be borne in mind. Besides its identity with the "tara" of Siberia, it seems, indeed, to share an affinity with the emotional diseases of most other countries; for example, with those of Griqualand, Norway, and Iceland, and with the "ramaninjana" of Madagascar, the "jumping disease" of North America, and the "shaking disease." In the Malay Confederated States cases are more evident in certain districts, such as Kedah, than in other parts, such as Perak.[4] On the whole it is not rare.

It seems almost impossible to define clearly the period of onset of latah. In nature it is essentially chronic, so that, without tragic complications it may last for many years. When the typical symptoms of the fit are developed there is no difficulty in recognising the disease. Those who are affected always present the curious exhibition of creatures who are unnaturally susceptible to the influence of subjective suggestion. There are at least two remarkable characteristics—(1) the induction of an attack by means of a sudden surprise, a startling appeal, or a direct command, and (2) the sequel of an extraordinary servile imitation of that which may appear indicated. In women an involuntary use of indecorous language is often a primary symptom of their temporary loss of volition. The provocation, whether accidental or wilful, physical or by word of mouth, must be sudden. It appears to be the effect of shock which finally overbears the balance of an unstable nervous system.

It would be difficult to classify the varieties of latah; variation in degree must obviously occur. In different individuals there may be a variation in mental tone during the attack and a greater or less degree of incapacity following its decline. Often at the close of an exhibition the patient, as if overcome by excitement or tremulous ecstacy, falls into a swoon. On recovery he is quite well, and is able to follow his occupation like any ordinary person. It seems that, for the time being, an advanced case of latah might be completely in the hands of an unprincipled operator. Then, on the impulse of the moment, any unreasonable act might unconsciously, as it were, be performed. Examples in which latah has been shown to play any part in the production of a crime are however, I believe, happily unknown. Although it may be generally evident that the power of self-control is absent, yet that this depends upon a definite and recognised disease may be far more difficult to prove. The medico-legal aspect of latah might consequently be of great importance. From the more or less constant grouping of symptoms it is evidently a distinct disease. It ought, therefore, to depend upon the abnormal condition of one or more organs. There can be no doubt that the mind is affected, but it is difficult to say whether this is the sole cause of the disease. There is no reason to suppose that it, any more than the Malay amok, is a modern disease. An exact reproduction of the original form does not now probably exist. It would be therefore unreasonable to surmise that the enforced burden of a complex civilisation has caused its development. It does not seem to have increased in any way by the influence of recent education of boys under Government direction. In fact it is less common among men than in Malay women, who, as a class, are still uneducated in a modern sense. The gradual removal of ignorant superstition by means of a lucid education may indeed prove to be the best prophylactic of the disease.

How far the influence of morbid impulse may go in causing both the state of latah and the blind passion of amok merits special attention. In both cases—self-control being lost for the time being—the attention is mainly occupied by a single idea—in the latah woman, by an uncontrollable desire to imitate, in which the servile portion of human nature is unconsciously displayed; in the amok man, by a reckless idea to persist in killing, in which the wild beast part of man comes uppermost.

Latah is necessarily paroxysmal in its manifestation. A gamut, if I may be allowed the expression, of such high-wrought feelings as surprise, amusement, vexation, indignation, rage, dismay, and furious frantic jealousy, which must have occurred in the case reported by Mr. Swettenham,[4] could not remain long in the same tone. This element of intermission is of significance. It may be inferred from it that no structural change affects the nervous system, especially as the general health remains unaffected. There is no indication of a progressive lesion; it is never fatal. Self-hypnotisation is clearly depicted in the clinical picture. In the words of Mr. Ernest Hart, as applied to hypnotism,[8] the latah person during her fit, is "but a marvellous and God-created machine abased and degraded by the abolition of intelligence and self-restraint." Anyone or anything can reduce her to this abnormal condition.

It would appear then, to be an obscure psychical condition, having its pathogenic origin perchance with both hysteria and hypnotism in a neurosis which lowers nerve force and brings about an abnormal reflex discharge of it. Bearing in mind, however, that the bias of the eccentricity inclines in one direction only, it might with amok be more practically viewed as a variety of monomania. At the same time, it is well to note that in the clinical cases there are no indications of degeneracy such as anatomical or physiological stigmata, unless the morbid emotional condition may be regarded as a physiological stigma.

The Malays themselves appear satisfied with the simple knowledge that a person is latah. They do not look upon it as being an illness in any way, but in general magnanimously refrain from influencing the sufferers to any extent. They are, however, ready to excuse even the most extravagant demonstration. Any proposal to treat the patient in an asylum would be good-humouredly rejected.

The cure of latah in the individual seems to be impossible until a precise knowledge of its pathology is obtained and verified, if possible, by means of *post-mortem* examination. Up till now this disease has not been affected by any remedy. The extraordinary mimetic tendency of monkeys might perhaps by experiment be developed into a condition identical with latah, and so afford knowledge which would lead to its cure. The aim of general treatment would appear to be to promote the *mens sana in corporo sano* by keeping both digestion and strength as perfect as possible, and at the same time, in order to make the patient's life happier, to shelter him as much as possible from the sportive suggestions of casual bystanders. Displays of this kind for the purpose of amusement cannot be too strongly deprecated, for one cannot but suppose the march of this peculiar disease to be influenced by the number of fits induced, and to be fostered by a lack of moral control.—*British Medical Journal*, 1897, *Volume ii., page* 455.

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[2] *Journal of Mental Science*, 1896
[3] *Die Krankheiten der warmen Länder.*
[4] F. A. Swettenham. *Malay Sketches.*
[5] Ecstacy.
[6] *La Géographie Médicale.*
[7] Described in *Quain's Dictionary of Medicine.*
[8] *Hypnotism, Mesmerism, and the New Witchcraft.*

A CASE OF COMPOUND DEPRESSED FRACTURE OF THE SKULL.

Government Hospital at Kuala Lipis, Pahang, Malay Peninsula.

THE following case is worth recording on account of the length of time—ten days—which elapsed before proper surgical relief could be afforded.

History.—The patient was a Chinese mining coolie, named Ng Hin, aged 43. On September 27th, 1898, at 4.30 A.M. he was standing up at the bottom of a wet shaft. Owing to carelessness in overloading or handling the shaft bucket, a piece of quartz fell down from above. The stone struck him on the top of the head, after a fall of approximately 45 feet. The injured man did not lose consciousness, and remembers being brought to the surface in a bucket. He says that directly after the accident he was unable to use his left arm and leg. He was attended to by a native dresser, who found an irregular, triradiate scalp wound about 1 inch in size and 1½ inch deep. There was also a smaller scalp wound. Both wounds exposed the bone; they were washed and sewn up on the spot with silk sutures. The unfortunate man remained under the dresser's care for ten days, and was admitted to hospital at noon on October 6th, 1898.

Condition on admission.—A complete motor monoplegia of the left upper and lower limb was apparent. Voluntary movement was entirely lost, but sensation was unimpaired. Paralysis of the facial muscles was also present in a lesser degree. A little to the right of the middle line, and 7½ inches from the root of the nose was a dirty wound covered by a tangled mass of hair. Temperature (axillary) was 101° F.; pulse regular and soft. The patient, who was a strong, muscular man, spoke cheerfully, but was much fatigued by his journey. The bowels had been confined for three days. Urine clear, acid; specific gravity 1034, no sugar, no albumen. He complained very sensibly of periodic attacks of fever, as well as of headache, giddiness, and sleeplessness. Respiration appeared to be normal. The pupils were equally contracted, I think from the effects of either opium or chandu taken previously. Each contracted to light.

Treatment.—The scalp was at once shaved, with the exception of the queue, and the wound thoroughly cleaned; a loose silk suture was removed and an antiseptic dressing applied; 5 gr. of calomel were given, followed by 5 gr. of quinine, which was repeated in four hours' time, with an ounce and a half of mistura alba. The bowels acted satisfactorily before morning, but vomiting occurred during the night. At daybreak his temperature was normal.

Operation.—Chloroform was administered, and the scalp again very carefully washed and rendered aseptic. By digital examination through the wound, a depressed ragged fracture of the right parietal bone could be felt near the superior border (its centre). I enlarged the original wound freely, turning two semilunar flaps of scalp upwards and downwards. A depressed fracture with comminution of fragments and almost bare of periosteum was now evident. Two small insulated pieces of bone with a tuft of hair were removed without difficulty. Other pieces could be felt jammed under the vault towards the middle line, firmly compressing the brain. I applied the trephine to the right, removing an irregular circle of bone $\frac{1}{2}$ inch in diameter, and was then able to elevate and remove in all six fragments of various sizes. Roughly these measured, when pieced together, 2 inches by 1, and weigh $1\frac{1}{4}$ drachm. Some blood clot was adherent to the lower surface. The dura mater had the appearance of having been bruised by the fracture. At one point posteriorly it had been slightly punctured; a sanious discharge was escaping. The wound was douched with perchloride of mercury lotion (1 in 1,000), and the operation finished by replacing the remnants of periosteum and accurately uniting the scalp wound. Strict antiseptic precautions were taken throughout as far as possible.

After-treatment.—Shortly afterwards the patient was found sitting up talking and asking for rice. He expressed himself much relieved as to his head, but was very depressed at being unable to move his limbs. The slight facial paralysis had disappeared. For the next three days the temperature was normal, and the wound healing by first intention, except at one spot. On the next day he had an attack of shivering and slight fever (101° F.). Ten grains of quinine were given morning and evening. There was no recurrence; it was evidently malarial fever. The stitches were removed on the fifth day (October 12th), the wound having now healed except at one small spot, which corresponded to the apex of the original scalp wound. This hole was gently plugged with a strip of cyanide gauze; pulsation of the brain beneath was now very evident. A small bedsore had formed on the left ankle. Full doses of syrup, ferri phosphatis cum quinia et strychniâ were prescribed. On October 17th, ten days after the operation, faradic electricity was applied to the paralysed limbs. Up till now there had been no return of power in them. On October 18th he was able to partly flex and extend the left ankle; on October 19th to move the fingers. By October 24th he was strolling about the verandah, and one month afterwards he left the hospital to return to his employment.

Remarks.—It is not often nowadays, that an uncomplicated case of traumatic hemiplegia is allowed to remain so long without surgical intervention. The only parallel case that I have reference to is one of Guthrie, quoted in Erichsen's *Science and Art of Surgery*, when a soldier was successfully trephined ten days after a bullet wound of the head. In the present case the effect of direct violence applied to the vertex in the parietal region was well exemplified by the driving inwards of the upper border of the bone. It was fortunate that the superior longitudinal sinus remained uninjured. From the position of the injury there could be no doubt that the "motor area of cerebral localisation" was severely pressed upon, and that the superior frontal and ascending parietal convolutions had been involved at the upper part of the sulcus of Rolando. From the sudden and continued symptoms of compression without loss of consciousness, the clinical inference was that the cause was local and outside the dura mater, and that it was probably due to pressure by bone alone. The bluish appearance of the dura mater, however, within the area of fracture was suggestive of subarachnoid hæmorrhage. Yet it seemed that the dura mater alone was torn. Leading symptoms of general compression, such as slowness of pulse and respiration, were not marked. There was no evident escape of cerebro-spinal fluid. Presumably the subdural space only was open, and the subarachnoid space intact. Bearing in mind the great natural barrier which the dura mater offers to septic infection, and that the preliminary conditions of cleanliness had not been good, I decided not to explore the subdural space at the time. Although there was no fear of the occurrence of hernia cerebri, antiseptic precautions having been taken, it was not improbable that failure of union by first intention might occur in a part of the scalp wound. This, indeed, happened at one spot, and a small hole was the result, which took many days to fill up by granulation. With regard to replacing the bone which was removed, this old scalp wound, the sanious discharge, and the age of the patient were, I think, against it, as well as the loss of periosteum. It would have been difficult, if not impossible, to wedge the pieces back to their exact relative positions so as to ensure accurate apposition. If a second operation had been necessary then grafting would have been futile. I believe the failure to relieve the symptoms at once must have been due chiefly to want of expansion of the brain from cardiac weakness. On the relief of the pressure there was, no doubt, an effusion of blood in the deeper layers of the grey matter from the over-distended blood vessels, as well as a certain amount of œdema, with, perhaps, a little secondary degeneration consequent on destruction of brain substance. This may have been at the arm centre, for muscular power returned in the upper limbs much more slowly than in the lower, and only after continuous application of the battery, massage, and gymnastic exercises. The complete recovery of this case bears out the truth of the observation that injuries to the area of the brain of this nature generally do well after operation.—*British Medical Journal*, 1899, *Volume ii., page* 1733.

A CASE OF LEPROSY.

Many clinical cases of leprosy have been published, but the simple example here recorded is of general interest. The patient was an unmarried Eurasian, aged 27 years. He was born in Singapore but had lived for some time in the Malay Native States. He was a clerk and interpreter in the police-court at Pekan. There was no case of phthisis in the family as far as was known. One sister suffered from "fits." His father and brother were alive and well. The mother had died in child-bed. The patient had had the ordinary ailments of childhood, but otherwise had been in fairly good health until about Christmas, 1894. He was then treated at Pekan for "simple rheumatic inflammation of the tendon sheaths with some degree of high temperature and glandular swellings." In March, 1896, this illness recurred and was accompanied by a curious bilateral purpuric eruption on the legs fugitive in character. There was again acute inflammation of the tendon sheaths of both feet and of the right hand. He was sent to Singapore, where he was found to be suffering from a peripheral neuritis which was diagnosed as beri-beri. About this time the legs were swollen and he was unable to walk. At the end of June, 1896, he returned to duty. He said that he had squandered his money ever since in the purchase of useless, empiric drugs, but that he had never felt himself again. During the last two years he had had attacks of dysenteric diarrhœa and had been gradually losing heart and strength.

When I saw the patient he complained greatly of weakness and said that his legs often felt useless, especially after walking. He had a rash which came and went. It was on the face, the legs, and the arms. It was not painful and did not itch. About six months previously sores broke out on his fingers, which healed up from time to time of their own accord. Four or five months previously he felt a small lump on the nose. It had given little or no inconvenience and had remained about the same size. He noted that he fumbled in dressing himself and could not button his clothes with ordinary precision. For some time he had had a chronic cold and had snuffled, but he had had no cough. The appetite was indifferent, the teeth were decayed, and the bowels were irregular. On examination he was found to be a tall, thin, sad-looking man with an unnatural aspect. The skin of the face was coarse, with a livid flush on each cheek. The ears were enlarged, projecting, and deformed, and were wrinkled and nodular. At the bridge of the nose there was a small broad tubercle. The eyebrows were scanty. The hands were wasted as if from paralysis of the ulnar nerve and the fingers showed clearly some trophic lesions in the skin. They were covered with dry sores, especially on the back of the phalangeal joints. Otherwise the skin here was smooth and glossy as if it had been varnished. There was impairment of sensation in the skin of the fingers and forearms and in places there was anæsthesia. The muscles of the arm and especially those of the forearms were wasted. The interossei muscles were atrophied, and doubtless an application of the Roentgen rays would already demonstrate atrophy of the metacarpal bones. The body generally was covered with large patches of brownish pigmentary stains. The chest was ill-developed, but the heart and lungs appeared to be normal. On the outer side of each leg there were patches of anæsthesia with purplish eruptions on the shins. A distinct nodule, among others, of about the size of a split pea could be felt on the extensor aspect of the right leg. The patient was sent to Singapore where he was seen by Dr. M. F. Simon, in consultation with Dr. J. T. Leask and Dr. W. G. Ellis. They found the bacilli of leprosy in large numbers in the discharge from a sore on the finger and in serum taken from a nodule on the ear.

I have much pleasure in expressing my thanks to the Principal Civil Medical Officer (Dr. Simon) for his kindness in confirming my diagnosis. There were no other cases of leprosy in Pekan at the time. The disease, in fact, is not common in Pahang, where it is usually met with among the poor of the native population. In this case, however, the patient was an intelligent member of the community following a public occupation and leading a more or less healthy life. It is an instance of the mystery which still surrounds the origin of isolated cases of leprosy. The history is of special interest now that the compulsory segregation of lepers is under the consideration of the Government.

It is agreed that leprosy is a contagious disease. All observers, however, who are not influenced by any theory and who have no desire to fit the facts of their cases to any favourite doctrine will, I think, admit that a certain number of cases appear to militate against a very widely received opinion as to the advisability of compulsory segregation. Ample as the reason for legal measures may be in the colonies, they will I think, allow that under certain circumstances voluntary isolation is a sufficient safeguard. I refer especially to those periods of latency which may occur during the course of the disease.

In the case given above the patient had given up his occupation and had made no attempt to trifle with his affliction. If any inquisitorial interference with his home had been instituted there would not have been wanting critics to designate it as a grave offence against the public liberty. Doubtless if the disease had been found out earlier he would have been discharged from his office long before. It may be fairly presumed, however, that until the open sores had developed he had not been an immediate source of danger to the crowds in the police courts. After that time the danger from inoculation would have been great. In this particular case the difficulties in diagnosis of the early stages of leprosy were well exemplified. It was at first confounded with an infective form of rheumatism and then with the peripheral neuritis of beri-beri. Later the patient was popularly supposed to be suffering from tertiary syphilis. Like hydrophobia and diphtheria, leprosy is most deadly when it forms a focus, and although the bacillus so closely resembles that of tuberculosis, the resisting power of man to the bacillus lepræ is probably not as great as that to the tubercle bacillus. In both cases isolation as a preventive measure affords the best and only protection for the public health, and although the hygienic treatment of tuberculosis in sanatoria seems likely to repay at last the persevering quest of modern scientists, the cure of the individual leper seems more likely to be brought about by the inoculation of some antitoxin.—*Lancet*, 1900, *Volume i., page* 611.

NOTES ON A CASE OF AMOK.

The following incident, which is known in English as "running amuck," is a fairly common occurrence among Malays.

Man, a Mohammedan, aged about 23 years, male, a native of Kedah, single, was formerly in the Perak Police Force, but left the service when his time expired and came to Pahang, where he obtained work as a carter at Sempam.

About the end of last June, Mr. Rance, his master, noticed that he was odd in his manner; he lolled about the house in a way unusual to him, and one day apparently had a delusion about seeing a monkey on a tree. He asked that it might be shot, and expressed himself as being queer in the head. In a letter dated October 2, Mr. Rance says: "His conduct was a little strange, but I put it down to his not agreeing with the other boys." For a few days he had been acting as a servant, but could not get on well with the others, who were all Chinese. He asked to leave on this account and was discharged.

Mr. Rance had known him for more than two years, and says: "When I heard of the amok I would not believe it, and was much astonished when it turned out to be true."

Man came into Tras, a place near Sempam, where he spent two nights in the jungle, eating little or nothing, and apparently wandering about alone; his legs were scratched with thorns, and he gave this in explanation on being questioned afterwards.

He was not a ne'er-do-well, an opium smoker, nor a foolish extravagant Malay. He had no debts, no quarrel or love affair, but was evidently "sakit hati" with the Chinese. The words "sakit hati," which form a phrase in common use among Malays, are defined in Marsden's "Dictionary of the Malay Language" as resentment, malice, bearing a grudge —heart (morally) ati.

"Ati," however, is sometimes referred to as meaning the liver, but as the seat of affections it corresponds with the word heart. The expression is, perhaps, better defined in an older dictionary (Howison's "Malay Dictionary," 1801) as: spite, envy, offence, vexation, an affront, sorry for, offended.

On July 6, 1900, Man came out of the jungle and went into a house at Tras where his native chief Ismail was staying. The house was empty at the time except for a Malay who was asleep. He took Ismail's sword from under his mat, went out by the back door and walked towards a Chinese shop in the village close by. Five Chinese and a Javanese coolie were sleeping and smoking opium in different rooms. It was mid-day; the men were strangers to Man. He slashed at the first two Chinese who were lying down and killed one, nearly striking his head off with the sword; he gave the other a severe wound on the face, which has since proved fatal.

Without uttering a cry he then diverged into a smaller room where two other Chinamen were lying down. He cut at one and brought him to his knees, killing him at once by a deep wound in the neck; the other man endeavoured to escape, but he wounded him on the arm and pursued him out of the door. The Javanese now seized him from behind and managed to drag the blade of the sword out of the hilt. It was loose. They struggled, Man fought and bit, crying out "I want to run amok." He finally "slipped away like a fish," to use a Javanese expression, and escaped almost naked into the village, where he armed himself with a large piece of timber. Several Sikh policemen forcibly arrested him, but he struggled so violently that he nearly broke away. At the inquest held the next day he could not be made to give any statement at all, but uttered a long continuous sort of whine. During the night he had done nothing but stamp and howl; the whole of Tras could hear him.

Two days later, the Assistant Commissioner of Police examined him in his cell. He talked in a friendly way, said he could not recollect the time spent in the jungle, and could remember nothing about the murders. He remarked that there were a few more "orang kapir" (non-Mohammedans) out of the world, and concluded that he must have killed them because he was charged with their murder by the Police. He ate rice, bathed and joked during the afternoon (July 8), but at midnight began to shout as if terrified, and was found crouching in the corner of his cell. He said it was full of people who wanted to kill him; he thought he saw them and begged to be taken out and tied up if necessary, to a tree in the jungle. He quieted down and was brought into the Kuala Lipis Gaol.

Since admission, on July 13, he has been in a solitary cell, quiet, sulky and reserved, but quite coherent and apparently rational, except that his memory of the murders seems to have been completely wiped out.

Man was certified as not insane by the surgeon in charge.

At that time he had been under observation for less than a month, and no complete history of the case was at hand. A good deal of the previous history has been gathered since from various sources.

Man is a well-developed Malay, apparently in good physical health. The knee-jerks are exaggerated; there is no history of syphilis. The urine is of low specific gravity—1006—does not contain sugar or albumen; the average quantity passed in twenty-four hours is forty-six ounces. Vision is normal, but the pupils are equally dilated. His eyes are restless, the look being uneasy and the glance unsteady. I am not able to record any physical signs of insanity. There is no aural or nasal disease; the facial expression shows mobility. He persistently denies all memory of the amok, and has repudiated the acts which he has committed, so often, that I consider that he had no motive for the crime, and that this obliteration of memory is a genuine symptom of some phase of mental disease.

On one particular occasion (September 8), at the end of a conversation, his eyes assumed a wild stare, and I believe he was about to spring at me. The European gaoler and a Tamil dresser who were present said that this was the first time that they had noticed any change of demeanour. His expression was that of an insane person; the eyes glared and were widely open.

In the Indian Penal Code (Mayne), in a commentary on Section 334—"Voluntarily causing hurt on provocation"—the words "to run amuck generally like a Malay" are used, and this is, I believe, the only special reference to amok in any Code. The commentary is as follows:—

"The meaning of this (Section 334, voluntarily causing hurt on provocation) and the following Section (causing grievous hurt on provocation), of course is, that if a person who has received provocation assails a person who has given the provocation, he is only liable to a light punishment. But if, while out of temper in consequence of the provocation he were to attack an innocent person, or to run amuck generally like a Malay, the previous provocation would be no excuse."

The idea that a Malay who runs amuck may be insane does not seem to have occurred to the commentator.

In the case of Man, three innocent people have been slain, others have been grievously hurt without giving any provocation, and he is liable by law to be hanged. It is well known that this sentence has been often carried out and with advantage in amok trials. In "Hakayit Abdulla" (Henry King & Co. London, 1894) it is recorded that on the death of Colonel Farquhar through an amok in Singapore many years ago, the sentence on the murderer by his own countrymen was that he should be punished by the execution of himself and his wives and children. The translator of the book comments on the severity of Malay laws on such occasions. He remarks, however, that, although they may be obnoxious to our moral code, yet they are the most applicable to the genius of the people, and form notoriously the safety-guards to native rulers, who have never been known to be assassinated.

I need only further refer to the almost classical instance in Penang in 1846, when the Chief Justice (Sir William Norris) passed the death sentence after the most severe summing-up, which, perhaps, has ever been uttered in an English Court of Law. The effect of this sentence seems to have checked the occurrence of amok for a time in Penang.

Similar cases have been tried and sentenced of late years both in the Straits Settlements and in the Federated Malay Straits. In the *Singapore Free Press*, of September 13, 1900, the trial of Hadji Alli, who ran amuck in Minto Road last May, is reported. In defence the plea of insanity was set up, but it was not accepted and the accused was sentenced to death. The trial of Hadji Sukor was held the next day for a similar offence, and, it is said, medical evidence on the state of the prisoner's mind was to the effect that nothing abnormal was noticed

On the other hand, there are always Malays who, having managed to evade violent deaths, at the time of their amok, from the hands of their comrades, have been subsequently acquitted on the plea of insanity.

Three such cases are quoted by Dr. Ellis (*Journal of Straits Medical Association*, August 21, 1897), who also gives a complete account of the Penang murders referred to above, in his article on "The Amok of the Malays," in the *Journal of the Straits Medical Association*, No. 4, Singapore, 1894.

The mere fact of a Malay having committed amok raises no presumption as to his sanity or insanity. He has simply run amuck. The Malays themselves in Pahang do not regard the occurrence as an exhibition of true insanity, being more inclined to ascribe it to spiritual agency, and I think the general tendency throughout the East is to regard it as a vice or crime rather than a disease.

Amok when scientifically considered seems to be a symptom which is subject to much individual variation. In most cases the individual appears to be rendered subconscious as in somnambulism, by the unrestrained action of his own automatic centres. In some cases, but not in all, this appears to be due to a special pathological condition—a physical condition, for want of a better word.

This physical condition seems to result, as it were from some reflex nervous disturbance or from an auto-intoxication, and to be due to an irresistible impulse of a purposive character.

It is characterised by: (1) A sudden paroxysmal homicide in the male, with evident loss of self-control. (2) A prodromal period of mental depression. (3) A fixed idea to persist in reckless homicide without any motive. (4) A subsequent loss of memory for the acts committed at the time.

There is constant grouping of these four cardinal symptoms in many of the cases of amok in which notes have been made. Unfortunately the references are very few in number.

They are cases of the true insanity of amok, and I think the history of Man may be taken as a typical example of a case of this kind of insanity.

In other instances, there may be no subsequent loss of memory, or there may be a doubt about it, and there is some motive for the amok. For the sake of convenience in description these cases may be referred to as instances of "false amok." It is undesirable, however, to regard amok as being, in any way, a specific disease. As an example of this "false amok" I may quote the case of a perfectly sane Malay who was under my care in Pahang a few years ago. On account of the infidelity of his wife he not only attempted to murder the friend who betrayed him but at the same time ran amok generally and succeeded in wounding several other people who had in no way offended him. Both varieties are popularly so-called cases of amok; it is very necessary therefore in making a diagnosis to recognise any definite clinical features, in order to differentiate, if possible, between sanity and insanity. Malays who are quite sane although perhaps subconscious, during the height of the attack, may be led to commit amok from motives of jealousy or revenge, or from some definite reason such as wounded vanity or a dread of death on the scaffold. A case has recently been reported from British North Borneo in which a Malay convict ran amok on the eve of his execution.

By no means do I go so far as to say that because a person has run amok that he should be exonerated from all criminality. But if he has the four definite symptoms mentioned above and has committed the act of amok without any possible motive, without profit to himself or any other person, without premeditation and consequently in a manner quite different from that in which murder is generally committed, it seems almost a certainty, at least in the case of a civilised person, that it is due to the mental disturbance of some form of insanity.

In the case of a European there would be but little doubt, but in the case of Malays who are so peculiarly apt, as a race, to run amok, the greatest caution is necessary when expressing an opinion. Even the special knowledge of a skilled alienist may be required. The difficulty of obtaining any family history from a Malay who has run amok, or practically from any native, adds to the danger of making a wrong diagnosis, and in this, as in other questions of criminality any open declaration of theory may put an unsupported witness in a false position in a Court of Law. It comes to be a matter of the highest importance, therefore, that every so-called case of amok should be kept under medical observation for a definite period before trial so that the mental aspect of each case may be decided on its merits, and the opinion of more than one medical practitioner may be heard.

Amok (a Malay word in actual use pronounced amox) is thus defined in Marsden's "Dictionary of the Malay Language": "Amuk—engaging furiously in battle, attacking with desperate resolution; rushing in a state of frenzy to the commission of indiscriminate murder; running amuck." It is applied to any animal in a state of vicious rage, and it is interesting to note that the Malay word niamok (mosquito), is derived from it.

The primary idea in the Malay mind is, I believe, that it is a state of violent delirium which should ensue when a brave man's blood is up in the excitement of battle. In Malay tales it is fitting for the hero to lead the attack recklessly, shouting "Amok! amok!" and taking no count of his foes.

It may be that the stimulus is still a memory image of the ancient battle cry coupled with the proud idea of dying sword in hand, but the kind of amok which now disturbs the public tranquillity from time to time in the days of quiet prosperity, has nothing to do with the actual reality of honourable warfare.

By "running amuck," as I understand the expression, is meant a more or less sudden outbreak which is characterised by an unprovoked attack on any one who may happen to be in the way. Defenceless women and children are frequently attacked.

The intent to kill is imperative, and it is worthy of remark that even the weapon used is chosen with the idea of attaining this object without fail. A stabbing or cutting weapon is invariably used in preference to a club or firearm, though, of course, this may be due to the fact that they are the national weapons and most likely to be at hand.

No case has come to my notice of an amok attack by a female or by a relative of one who has run amok. It has been said, but I do not know on what authority, that the tendency is a very infectious one, especially among the relatives of those who have perpetrated the act.

Amok seems to be unknown among the Sakei or aboriginal inhabitants of Malaya.

The attack might be induced under the special circumstances of strong suggestion in a Malay native either male or female. That it should otherwise be almost universally confined to the male sex is a point of some psychological interest.

Some observers are of opinion that amok is merely an exhibition of bad temper; others that it is a kind of suicide on the part of a desperate Malay. For example, it has been supposed that the sane Mohammedan, not daring to take his own life in accordance with the Koran, hopes to attain his object by being destroyed in the frenzy of an amok. And, indeed, many men have been summarily despatched for running amok by their fellow Malays. I think the inference is unjustifiable because the natural prejudice against suicide is almost universal amongst Malays. Ordinary suicide is very rare among the males, although it is not unknown. In 1898 there was a case in Pahang in which a Malay quietly cut his throat in a boat on the Jelai river. He was ill and was supposed to be insane. Another Malay was under my care with a cut throat in Kuala Lipis in 1898. He was obviously insane, and subsequently died in the Selangor Asylum.

Another case occurred in the Jelai district in 1895 in which a Malay girl, on the eve of her marriage, cut her own throat with a razor belonging to her father.

The history is pathetic and has formed material for a novel. Before her death she was asked her reason for having cut her throat, and she replied that, whilst combing her hair in front of the looking glass, the ugliness of her own features was more than she could bear, so she desired to commit suicide being too ugly to live. The only case of suicide which seems to bear upon amok is one which occurred fifteen years ago in Perak, when a Malay ran amok, and after wounding several people drew his weapon across his own throat and so died, in order, apparently, to prevent himself being captured alive. It is logically incorrect, however, to conclude that a naturally indolent Malay will go to the exertion of a preliminary amok merely with the idea of bringing about his own destruction.

The well-known association of suicidal mania with religious melancholia seems to have led other observers to conclude that the influence of the Mohammedan religion may be a factor in the causation. But although amok has made the Malays and their descendants notorious all over the world, it does not appear to have affected the millions of Mussulmans in Turkey and most other Mohammedan countries. The victims generally fall quite independently of creed, nationality, or relationship. And, although a good deal of religious fanaticism may be induced in the *mêléc*, I do not think from what I know of Pahang Malays that the pure Mohammedan religion has anything to do with amok.

The religion of the Malay native is, speaking generally, made up of a superstitious and very conservative belief in old charms and magic as well as public worship at the mosques and high places.

As far as the unpremeditated murders of amok go I think that the laws of the Koran relating to murder clearly support the opinion, except perhaps in some cases of "false amok." I doubt whether the ordinary Pahang villager has ever studied these laws, but the question seems to be of little importance, because doubtless Malays have been carried away by the blind passion of amok long before the comparatively modern conversion of the race to Mohammedanism. Indeed the occurrence was much more prevalent in the old days, and, as Mr. Clifford says in his Dictionary, the advance of civilisation has done much to repress this peculiarity of the Malays, and amok running is becoming yearly more rare.

The mental upheaval of amok has some of the clinical features of epileptic mania. There is impulsiveness, violence, homicide, and destructiveness. Mr. Clifford notes that a man who runs amok may purposely collect and destroy his most valuable possessions.

It seems to resemble also very closely the automatic condition left after an epileptic fit, more particularly the so-called "procursive" or "procursine" epilepsy, in which the patient starts to run. To "run amuck" is a universal expression.

The red vision or field of blood, which has been described in some cases of amok, is also significant of an epileptic aura, but there seem to be no motor or visceral auræ.

Although according to Trousseau (Trousseau's "Clinical Medicine," vol. i., p. 67), Mohammed himself was said to be an epileptic. I have not yet seen or recognised either petit-mal or haut-mal in Pahang Mohammedans, nor the more or less regular manifestations of epileptic larvee.

There is no history of Man having had fits during childhood, and he has had none of the ordinary signs of epilepsy since he has been under observation.

At his trial, on October 8, 1900, he was judged to be insane chiefly on account of the fact that he had loss of memory, which, coupled with the previous history of delusion and hallucination, was sufficient to allow that he had been unconscious of his actions when he ran amok.

The demeanour of the prisoner in Court was curious —he was no longer depressed. His spirits seemed to rise and he was almost excited at times; he had loss of memory for names of places, and was evidently not alive to the fact that he was being tried for his life. He was transferred to the Selangor Asylum on November 29, 1900.

The future history of this case will be of great interest. It may supply material for reflection with regard to the recurrence of symptoms which sometimes occur in amok, and thus prove of general as well as special interest. —*The Journal of Tropical Medicine*, 1901, *page* 195.

"AMOK."

In the last number of the *Medical Archives* of the Federated Malay States there is an interesting paper by Dr. Gimlette, the acting State Surgeon, Pahang, on "amok." The word is one of the few words of Malay origin which have become established in the English language, and is defined in Marsden's *Dictionary of the Malay Language* as "engaging furiously in battle, attacking with desperate resolution, rushing in a state of frenzy to the commission of indiscriminate murder, running amok." Dr. Gimlette thinks that the primary idea of "amuck" in the Malay mind is that of such a state of delirium as would ensue when a man's blood is up in the excitement of battle. He states that it is applied also to any animal in a state of vicious rage, and he adds that "niamok," the Malay word for a mosquito, is derived from it, a derivation which gives a lurid idea of the habits and customs of the Malay mosquito. Dr. Gimlette gives a full description of a case which came under his observation in a Malay man, aged about 23 years. He had been in the police force, but at the time of his attack was employed as a servant; his master noticed that he became odd in manner; one day he had a delusion that he saw a monkey in a tree, was feverish, said he felt queer in the head, and was discharged from his work; he then spent two nights in the jungle, eating little or nothing. So far as was known he had no debts, no quarrel or love affairs and was not an opium smoker, but he had some grudge against the Chinese servants. After his two days in the jungle the man went into a village, stole a sword walked to a Chinese shop close at hand where there were five Chinese and a Javanese coolie eating and smoking opium; it was midday, and the men were strangers to him. He killed one of the Chinese, nearly striking his head off with the sword, and gave another a mortal wound; he then, without uttering any cry, as appears to be usual with a man running amok, went into another room and killed one of two Chinamen lying down there, the other he wounded, and when the man escaped pursued him out of the door. The Javanese seized him, and in the struggle dragged the blade of the sword out of the hilt; the man, crying out "I want to run amok," slipped away and armed himself with a piece of timber. He was with difficulty secured by the police. During the night he was wild and excited, and next day his eyes had a glassy appearance; he refused to make any statement, but uttered a long continuous whine. Two days later he appeared to have recovered his ordinary condition, and declared he could remember nothing about the murders. At midnight he began to shout as if terrified, and asserted that the cell was full of people who wanted to kill him. When medically examined he appeared to be in good physical health, and persistently denied all recollection of the murders. On one occasion, somewhat later, when being examined by Dr. Gimlette, towards the end of a conversation, his eyes assumed a wild stare, and he seemed about to spring at his examiner, but he does not appear to have had any distinct epileptic fit. Dr. Gimlette states that in amok there is a sudden paroxysmal homicidal condition, with a fixed idea to persist in reckless killing, which is due to an irresistible impulse of a purposive character, the attack being preceded by a period of mental depression, and followed by loss of memory. In some cases the symptoms resemble very closely the automatic condition, left after an epileptic fit, more especially the so-called procursive epilepsy in which the patient starts to run.

At the trial of this man Dr. Gimlette expressed the opinion that he was really insane because of the fact that he had lost all memory. This, coupled with a previous history of delusion and hallucination, was sufficient to show that he had been unconscious of his actions. While under trial the accused was not depressed, was, in fact, almost excited, at times had loss of memory for names and places, and was evidently not alive to the fact that he was being tried for his life. He was sentenced to be detained for life in a gaol or asylum pending the Sultan's pleasure. In the discussion of Dr. Gimlette's paper, which was read at the Conference of Medical Officers of the Federated Malay States held last year in Kuala Lumpur, Dr. Fox, Acting State Surgeon, Perak, said that he had seen 12 cases of amok ordered to be detained during the Sultan's pleasure; 5 had subsequently shown no other symptoms of insanity, whereas the others had. Dr. Connolly related one case which had come under his observation in which there was a well-marked hereditary taint. He did not think that amok was peculiar to the Malay race; a parallel was afforded by such instances as that of a soldier who would suddenly start up in barracks and shoot his comrade or his officer, and wind up by shooting himself. Attacks characterised by homicidal impulse, were met with in natives of Burmah, of the North West Provinces of India, of Arabia, and among negroes of the Western Soudan. On the whole the general opinion appeared to be that under the same general term were included two classes of cases—cases of homicidal mania, which presented other signs of insanity—and cases in which provocation, real or supposed, afforded a distinct motive for revenge. The conference recommended that a Board of medical men should examine every case of amok before trial, and that as a rule a man should be kept under medical observation for a period of not less than four months before trial.—*British Medical Journal*, 1901, *Volume i., page* 1569.

AN EPIDEMIC OF ZINC POISONING THROUGH DRINKING CONTAMINATED WATER IN THE TROPICS.

Dr. Gimlette stated that the epidemic occurred during 1900, among a half company of men of the Malay States Guides (Sikhs and Pathans) stationed at Kuala Lipis, Pahang. The men lived in barracks, which were built in 1898, and were roofed with galvanised iron. In January, 1900, galvanised iron tanks were supplied in order that water might be collected from the roofs of the buildings, the water-supply having been obtained previously from a large river in the neighbourhood. In 1900 an unusually large number of men were attacked with gastro-intestinal troubles and at the close of the year it was found that 43 individuals out of the 56 men of the half-company had suffered. Dr. Gimlette began to suspect some form of metallic poisoning and sent samples of water to the Government analyst in Singapore, who reported acid carbonate of zinc in solution in large quantities, from 5·82 to 11·45 parts per 1,000,000. Discontinuance of the water was ordered and the number of gastro-intestinal patients steadily decreased, only 22 cases (many of these being old patients) having been treated from January until April, 1901. The symptoms presented were those of colic, diarrhœa with consequent anæmia and emaciations, and a spurious kind of dysentery. A clinical account of six typical cases, with one death from exhaustion from long-continued diarrhœa, was given in the paper. In concluding Dr. Gimlette asked a pertinent question as to whether it was not advisable that inquiry should be made as to possible contamination of water in places in Australia and South Africa where water was collected from galvanised iron roofs, especially in regard to the prevalence of gastro-intestinal disease in the latter country.

Dr. Manson, Dr. M. F. Simon, Dr. E. Henderson, and Mr. J. Cantlie joined in the discussion upon the relation of beri-beri to metallic poisoning, and all concurred in negativing the assumption.—*Lancet*, 1901, *Volume ii., page* 557.

AN EPIDEMIC OF ZINC POISONING THROUGH DRINKING CONTAMINATED WATER IN THE TROPICS.

The poisonous effects of various salts of zinc have been demonstrated from time to time. In England they have been reported from brass foundries as due to the oxide, and have been traced to the sulphate in the adulteration of cheese, apparently to the oxide in injurious ice cream, to the chloride in cheap wearing apparel, as well as to the carbonate in drinking water supplied by means of galvanised iron pipes.[1] Instances of the latter kind of poisoning in the tropics are perhaps not so widely known as at home. In 1900 part of an Indian regiment, the Malay States Guides, stationed at Pahang, suffered from zinc poisoning to a very marked degree.

The 56 men who formed the detachment were transferred from the neighbouring State of Perak in March, 1900. I took over medical charge of this half-company in September, 1900, and found that the health of the men had been very bad during the previous six months. Gastro-intestinal complaints were so frequent and serious as to almost verge on an epidemic. Route marching had been curtailed, early bathing prohibited, and it had been supposed in July that a form of dysentery was endemic in the barracks. Inquiry showed that the half-company was composed partly of Sikh soldiers and partly of Pathans, living in parallel and identical barracks on an isolated hill, a short distance from the town of Kuala Lipis and about 43 feet above it. The two buildings were erected in 1898 on an artificially-levelled flat, the surface of which was of stiff clay streaked with laterite. Each barrack was 90 feet in length by 40 feet wide, roofed in 1898 with sheets of 22 B.W.G. corrugated iron.

In 1900, for the convenience of water supply, a galvanised iron tank (capacity 400 gallons) had been supplied to each building, one being for the use of the 31 Sikhs, the other for the 25 Pathans who made up the strength of the half-company. Rain water was collected for the first time in January, 1900, from the roofs by means of zinc gutters and down spouts leading into the tanks. No rain-water separators or other appliances were in use with a view of discharging the first water collected. The water supply had previously been carried from a large river at the foot of the hill.

The galvanised iron roofs had not been covered with a thatch and were not painted. The tanks only had been painted green outside and washed with cement inside. There is but little vegetation in immediate proximity to the barrack square, but the jungle soil in the vicinity of the barracks is shaded and thickly covered with vegetable and organic matter in an active state of growth and decay owing to the peculiarly hot and moist character of the climate.

In October I suspected that the cause acting so injuriously on the health of the Guides was due to the irritant action of some metallic poison, and surmised that it was some salt of zinc in combination with an organic acid or acids. By a rough application of the usual chemical tests I found in December that the water from each tank, as well as that caught directly from the roof, contained the metal zinc in poisonous quantities, and my deductions were subsequently confirmed by special analysis.

Mr. P. J. Burgess, M.A., Government Analyst, Straits Settlements, whose report on this water is attached, reports that the water taken directly from the roof is organically a dirty water and unfit for domestic purposes, while water taken from the tanks is as far as organic impurities go, fit for drinking. And that the tank water held zinc in solution as the acid carbonate, 4·82 parts per million in quantity as compared to that taken directly from the roof which held 11·15 parts per million in solution.

It is thus proved that zinc existed in the water in sufficient amount to cause poisoning and the medical history of the health of the detachment will prove that to this alone was their illness due. Similar detachments from the Malay States Guides who occupied these barracks, used water from other sources. They were under my care in 1898 and 1899. The numbers under treatment for gastro-intestinal complaints were not very large during these two years for this class of native.

The present detachment used the zinc-contaminated water from their first arrival in March, 1900, until the end of the year, when its use was forbidden and prevented. After its use was stopped the number of patients steadily decreased. There have been no new cases of this kind and the general health has much improved.

In 1900 colic, diarrhœa, and a spurious form of dysentery were persistently complained of. The health had never been affected in this way before, as the following records of attendance for this class of case, taken before, during, and after using this water supply will prove:

From March to October, 1898, 30 men were under treatment for this class of case; in 1899, for the same months, 58 patients. In 1900, during the same period, 219 men, and, at the close of the year, it was found that 43 different individuals out of the 56 had been on the sick list on account of gastro-intestinal disorders. Nine men and 1 woman had been transferred on medical certificate. One patient was recommended for four months' sick leave to India; 5 others, who had constantly been on the sick list, took all the leave which was due to them. Seven voluntarily left the service on the termination of their agreements on account of ill-health, and one of them subsequently died in Selangor. Another died at Kuala Lipis. The spirit of the remaining 31 men of the original Perak detachment was broken, and the general loss of tone was very noticeable.

During 1900—from January till April—only 22 have been treated for these complaints, and the figures are very striking when it is remembered that out of these 22 cases many have been old patients from 1900.

A brief clinical account of 6 cases, typical of the prevailing sickness in 1900, is here given:

1. P. S., aged 25, lance-corporal, Sikh, had been an out-patient during April for "colic;" was admitted to hospital on May 10th, 1900, for "dysentery," remained sixteen days, and was discharged, but was readmitted on June 30th for diarrhœa and colic, suffered from vomiting and violent retching; the vomited matter was sometimes streaked with blood. He was placed on milk diet and recovered, but was again admitted on July 30th for dyspepsia and anæmia; returned to duty, but was readmitted for the fourth time on

October 3rd, and was subsequently transferred to Selangor very much reduced in weight and strength.

2. A. S., aged 25, private, a Pathan of powerful physique, was first treated as an out-patient for diarrhœa at the commencement of June, 1900; was admitted to hospital on June 28th, remained eight days on milk diet, recovered, and was discharged, but readmitted on July 24th for diarrhœa. He remained ten days, and recovered on milk diet. On October 25th was readmitted for "dyspepsia" very much prostrated in strength, and was transferred to Selangor after two months in hospital. This man's weight was taken on October 1st, 1900; it was then 129½ lbs.; again on October 15th, 126 lbs.; again on October 31st, 123 lbs.

3. V. S., aged 27 years, private, Sikh, a fine soldier of good physique, was admitted on June 22nd for "dyspepsia" and "diarrhœa." Previous health bad, as he had been an out-patient for some time; suffered from stomatitis. He was readmitted on August 28th, and died on September 27th, 1900. He persistently complained of pain referred to the region of the stomach, suffered from violent vomiting and diarrhœa, and became much emaciated. The muscles of the calves and thumbs were notably atrophied; he had no fever and no cerebral symptoms, and died of inanition. No *post-mortem* examination was practicable.

4. S. S., aged 27, bugler, Sikh, a young soldier, had been an out-patient for two or three days in March, was admitted on June 18th for dysentery, was readmitted on October 5th for dyspepsia. He complained of colic, diarrhœa, and vomiting, and also had slight hæmatemesis. Progressive loss of strength and flesh was very marked. There were no physical signs of disease. Worms were suspected, and he was given castor oil and santonin without result. On December 3rd this man's weight was 106 lbs., on the 12th 101 lbs., on the 28th 98 lbs. He was given alcohol and cod-liver oil without benefit, and was subsequently transferred to Selangor.

5. P. B., aged 23, private, a well-built Pathan, had been treated as an out-patient for colic and dyspepsia, was admitted to hospital for diarrhœa on August 1st, 1900, discharged as cured after six days; had been placed on milk and rice-water diet. Readmitted on December 31st for "dysentery," thin, emaciated, and very anæmic in appearance; general febrile disturbance; griping pain in stomach; stools frequent, but not offensive; contained ropy mucus and blood. Was given phosphate of soda in 4-drachm doses three times a day. He recovered and was discharged in thirteen days, but readmitted on February 15th, 1901, for general debility. General loss of flesh, but no cramps or anæsthesia was complained of. Blood poor in quality on microscopical examination; chemical examination of the urine for zinc negative.

6. G. S., aged 26 years, private, Sikh, had been an out-patient since May 10th with "dysentery." Was admitted to hospital on May 13th for melæna, remained in the ward for five days, and recovered on milk diet; was supposed to have had ulcer of the rectum, Readmitted on October 9th with diarrhœa and melæna, recovered again in five days, but has been under treatment as an out-patient for anæmia.

This man, as well as the foregoing patients, was very anæmic.

Special points of interest in the clinical histories are:

1. The fact that gastric symptoms predominated over nervous symptoms. It is difficult to offer any satisfactory reason as to why this should have occurred except that it is a common experience in the East that Sikhs suffer greatly from irritative dyspepsia even under ordinary circumstances, and are not often attacked with neuritis. As far as my experience in Pahang goes they have been notably exempt from the prevalent form of peripheral neuritis which is very commonly met with in beri-beri.

2. The fact that all the Sikh patients had had their

diets prepared at the barracks and had their drinking water supplied from the contaminated tank all the time they had been in the wards. This was on account of their religious custom, which forbids them to use food prepared by other than their own nationality, or to drink water unless it has been carried by a Sikh. The Pathans, on the other hand, being Mussulmans, were supplied with the ward diets and water by the hospital cook, who is a Mohammedan. They were also accustomed to eat and drink with their Mohammedan friends in the town, but the Sikh soldiers had few opportunities of feeding outside barracks. The hospital returns show that the Sikh soldiers suffered in a proportion of almost 2 to 1 as compared to the Pathans.

3. The slow and deadly action of zinc poisoning by administration in small but continuous doses was well exemplified. In some cases it seemed to suggest the possibility of zinc being an accumulative poison. Emaciation was, generally speaking, an evident symptom and was so marked in the case of V. S. as to suggest malignant disease of the stomach at the time of his death.

With regard to the chemical analysis of the water, it is necessary to say that the samples A and B mentioned in the analyst's report were taken from the Pathan's tank. It was not possible at the time, owing to a short drought, to send Mr. Burgess samples from the Sikh's tank. An excess of zinc was found in this water by me as compared to the other. For the same reason it took some days to collect the sample C, which was taken directly from the roof. The surfaces of the corrugated iron were not flushed with rain as is usually the case. This no doubt accounts for the large amount of organic matter which was found in this particular sample, and may explain the excess of zinc in it through non-dilution of the water. The roofs at Kuala Lipis are covered with white patches of oxide of zinc.

The amount of carbonate in solution in the tank water which caused so much sickness at Kuala Lipis is comparatively small in quantity. It is less than one-fifteenth of that found in the contaminated water supplied to Cwmfelin, near Llanelly, a few years ago.

It is interesting to note in connection with the latter instance, which is reported in the *Lancet* of July 29th 1893, that the Pahang water was also essentially a soft water. The occurrence of this rather rare instance of poisoning suggests the advisability of a special inquiry with regard to a possible contamination of water in the towns of Australia and South Africa where galvanised iron roofs and tanks are used for the purpose of collecting and storing rain water, and although soil and circumstances undoubtedly play a chief part in the causation of typhoid fever in these countries, it is not unreasonable to suppose that zinc poisoning might be a factor in the causation of some of the gastro-intestinal symptoms. It appears that only after prolonged boiling and subsequent filtration water containing the acid carbonate of zinc might be harmless. It must be borne in mind, however, that the climates are essentially different, and perhaps in this may be found the determining cause of the Pahang epidemic. The mean annual temperature at Kuala Lipis in 1900 was 82.0° F., the minimum temperature 71° F., the rainfall 9.69 inches, with an average number of thirteen rainy days per month.

REFERENCES.

[1] *Lancet*, vol. ii, 1897; vol, ii. 1896; vol. ii, 1893.

REPORTS BY DR. P. J. BURGESS, Government Analyst.

Government Analyst's Office,
Singapore, April 12th, 1901.

Report on Three Samples of Water, and a Piece of Zinc Gutter sent for analysis by the Resident Surgeon of Pahang.

The samples were labelled as follows: A, B, C, D, E, and F. Of these A, B, C, D, and E were samples of water in soldered tins. Sample B was a duplicate of A, and sample E a duplicate of D.

Samples of water A, B, D, and E were taken from the storage tanks, and Sample C was taken direct from the roof.

Sample F was a wooden box, containing a piece of zinc gutter pipe.

Experimental Results.

A preliminary determination of the quality of the samples as drinking water was made, with the results as given in the attached Report I.

From these results it is shown that the water C is organically a dirty water, and unfit for domestic purposes, while A, B, and D, E, are fit for drinking.

These results, however, cannot be taken as true indications of the quality of the waters, on account of the time that had elapsed during the transit of the samples from the place of collection to this laboratory.

The results obtained by the resident surgeon of Pahang, namely, that zinc was present in the water, were then qualitatively confirmed, and an estimation of the amount of the metal was made. These results are given in Report II.

The water held the zinc in solution as the acid carbonate, and boiling the water in an open dish led to the precipitation of zinc, as the normal carbonate of zinc. The presence of zinc in this case is, in fact, precisely analogous to the frequent and harmless presence of calcium carbonate in waters which are technically termed "temporary hard."

An examination of the zinc gutter F showed that a considerable amount of dust and fine sediment had accumulated in the gutter. When this superficial deposit was removed round patches of a white powder were found closely adherent to the zinc surface. Portions of this powder were collected and analysed, and it proved to contain: zinc, 52.1 per cent.; carbon dioxide, 20.2 per cent. This percentage corresponds to approximately a basic zinc carbonate, and the practical difficulty in obtaining the white powder free from surrounding dust would naturally lead to results showing low percentage of zinc and carbon dioxide.

An anaylsis of the loose brown dust in the gutter was then made, and it was found to consist approximately: matter, insoluble in strong acids, 70 per cent.; zinc carbonate, 5 per cent.; ferric oxide, 9 per cent. Moisture and other soluble matter were present. Only an approximate analysis of this dust was made, because the composition varied with the mode of removing it from the gutter. The results, however, are sufficient to show that the dust contained considerable quantities of zinc salt.

Conclusions.

There can from the foregoing results be no doubt that the water under examination is contaminated with zinc, and the amount is sufficient to cause zinc poisoning by long and continued use of the water. The zinc is in actual solution in the water, and filtration would not be efficient in removing the zinc. This is shown by the quantitative results obtained on filtered and unfiltered samples of the water. (*Vide* Report II.)

The source of the zinc has undoubtedly been the zinc surface over which the water has run during the collection, and the water has been enabled to hold the zinc in solution by being impregnated with carbonic acid.

As this carbonic acid is expelled from the water the zinc is thrown out of solution, and it is to this partial purification of the water by standing and loss thereby of carbon dioxide, that I attribute the amount of zinc in water A, B, and D, E, being smaller than it is in sample C, which was taken direct from the zinc roof.

I am inclined to believe that, provided the surfaces of the roofs and gutters were clean, there would be no danger of zinc pollution of the water, and that the immediate sources from which the zinc is derived are the small patches of zinc carbonate, which are found in the gutter, and which I suspect would also be found scattered over the galvanised iron roof.

These patches of zinc carbonate are formed by the action of the decomposition products of organic matter which may have collected, and have remained lying in the gutters and on the roof.

REPORT I.

Samples.	A	B	C	D	E
Chlorine (grain per gallon)	0·56	0·700	0·560	0·28	0·420
Free Ammonia (parts per million)	0·07	0·128	0·420	0·01	0·000
Albuminoid ammonia (parts per million)	0·04	0·66	0·182	0·11	0·134

REPORT II.

Samples.	A, B	C	D, E
Total solid residue (parts per million) ...	72·80	52·80	45·70
Total solid residue in filtered water (parts per million)	46·00	34·20	16·00
Zinc (parts per million)	4·82	11·15	3·35
Zinc, in filtered water (parts per million)	4·25	8·90	2·20
Iron (parts per million)	7·09	19·36	2·80

The remainder of the solid residue consisted of organic matter, salt of sodium and potassium, and traces of lime.

British Medical Journal, 1901, *Volume ii.*, *page* 615.

Sep 7.

DATURA POISONING IN THE FEDERATED MALAY STATES.

It has long been known that datura fastuosa, datura stramonium, and some other plants of the nightshade family, such as atropa belladonna and hyoscyamus niger, possess poisonous properties.

Botany of the Daturas.

The species D. fastuosa and D. alba are members of the genus datura which are commonly found in the Federated Malay States. They are wild or semi-wild plants, which grow on the refuse land of our native villages or thrive on the borders of cultivated land, in the kitchen gardens, near stables, and elsewhere. These two plants of the Peninsula are identical with the datura fastuosa (Linn.) and the datura alba (Nees) of India, where they are also found more or less commonly with other members of the same genus.

Datura fastuosa (Linn.), the black datura, is generally taken as a type of the tropical varieties of the daturas. It is a quickly-growing herbaceous plant belonging to the natural order *Solanaceae*, about 4 to 6 feet high, with widely-spreading branches and conspicuous trumpet-shaped flowers.

Habitat.—Common almost everywhere, especially when protected. Malay name—"*kechubong itam*" or "*kechubong ulong*"; "*trong pungah*" in Kedah.

Distribution.—South-Eastern Asia and Malay Archipelago. Leaves: broadly ovate, often about 5 to 10 in. long (12.5 to 25 cm.), and 4 in. broad (19 cm.) at the widest part, margin repandly toothed, petiole 4¼ in. (11 cm.) long, apex acute, base unequal, glabrous or sparsely tomentose upper surface dark greyish green, under surface paler. The fresh leaves exhale a fetid smell when bruised, and have a slightly bitter taste. Flowers: axillary, on short peduncles about ½ in. (1 cm.) in length, single erect. Calyx tubular, five angled, five toothed, teeth reaching about half the length of the corolla tube. Corolla funnel shaped (infundibuliform), purple or white without, and white within; five-lobed twisted in bud. Lobes oblong-ovate, cuspidate, length of funnel about 6 in. (15 cm.). Stamens inserted near the base of the tube, included, anthers linear with parallel cells opening by introrse slits. Ovary two-celled, falsely four-celled by false septa, ovules attached to both the true and the false septa. Style filiform, stigma bilamellate. Fruit an oblong globular capsule, 1½ in. (4 cm.) in diameter, spinous, dehiscing by halves, seeds indefinite embyro with characteristic curvation. Fruit stalk recurring with maturity until the ripe fruit becomes pendant.

Datura alba (Nees), the white datura, *kechubong puteh*, is a taller plant than the preceding, with trumpet-shaped flowers, either pure white in colour, or yellowish-white tipped with violet. The flower is smaller and more tubular in shape than that of the datura fastuosa, the teeth of the calyx being less than half the size, and lanceolate acuminate in shape. The differences between the two plants, however, are so slight that they can scarcely be classed as being specifically distinct from each other.

Datura alba is the common datura of the Federated Malay States, but in certain districts datura fastuosa is said to be the more common of the two. Both plants are found in the Straits Settlements.

Datura stramonium (Linné), owing to its wide distribution in Europe and America, as well as in Asia, the best of all the ten or twelve species which have been recognised, is probably D. stramonium, or the dwarf thorn apple, which, however, so far as I know, does not occur in the Federated Malay States. It is necessary to refer to it, as it has been taken as the type of the temperate or tropical-alpine series, and because of the almost identical toxological significance which is attached to the datura fastuosa, datura alba, and datura stramonium at the present time.

Popular descriptions of the tropical daturas as the black and white kinds has led to a great deal of confusion, it having been often taken for granted, on the authority of natives of India, that the black datura possesses more powerfully poisonous properties than the white, but of the same nature. No proof of this, however, has yet been given. By reference to the colour of the flowers alone no botanical distinction can be made, and it may be remarked that soil and circumstaces may modify the colour of the flower or even double or treble the corolla.

Description of the Datura Seeds.—The seeds, in which the poisonous property chiefly exists, bear some slight resemblance to those of the common chillies (capsicum), and at times have been mistaken for them.

In many instances the light colour and the pungent taste of the latter would be sufficient to make a distinction, but when either is cooked and mixed with food, such as boiled rice, recognition by means of the taste alone cannot be relied upon. The resemblance is most marked in the unripe seeds, but a careful comparison of the two kinds shows many morphological points of difference; the datura alba seed is almost reniform in shape, having one end smaller than the other. It has been not altogether fancifully compared to the human ear, but the margin is angular; size about $\frac{1}{4}$ in. (5 millimetres) in length, rather less in width;

no marked odour; taste slightly bitter; surface somewhat shrivelled except on the two compressed sides; testa tough and rough, being made up of a convoluted series of thick-walled cells, so arranged as to give a pitted appearance when seen with a lens. Datura seeds in powder may be distinguished by means of the cavernous appearance of their exosperm when seen under the microscope.

The embryo is embedded in a white oily albumen, and curved in a manner peculiar to the genus. By cutting parallel to the flattened side the embryo may be seen by the naked eye to be curved, twisted, and recurved, so as to resemble the head of a shepherd's crook.

A watery decoction of the datura seeds, when placed in the eye, will cause dilatation of the pupil.

The seed of the capsicum is kidney-shaped, a little shorter and wider than that of the datura, pale yellow in colour, uniformly rough, and when seen in section as described above, the embryo is found in a flesh albumen and curved like the figure 6. Capsicum seeds in powder may be recognised by means of the application of heat, the acrid vapours of capsicum, being at once detected by heating even a small portion.

A watery decoction, when placed in the eye, causes irritation without dilatation of the pupil. The seeds of the datura fastuosa resemble those of datura alba. They are about $\frac{1}{6}$ in. (4 millimetres) long, of an oblong kidney shape, flatter and darker in colour. About eight of them weigh 1 gr. in the dried state.

DATURA POISONING: CLINICAL CASES.

Death from datura poisoning seems to be comparatively rare; but, although the drug has been known medicinally in the East from time immemorial, and is often used by Asiatics for purposes of revenge or for drugging victims with criminal intent; lethal doses are seldom given intentionally. Three instances of drugging by datura have recently occurred in Pahang and one in Selangor. It is to be observed that these four cases merely furnish examples of the datura poisoning which is of every day occurrence in India.

Case I. *Datura Seeds mixed with Food by Pahang Malays.*—In the month of April, 1896, a Malay named Saiyed, was charged at Kuala Lipis, Pahang, with causing hurt by means of poison. He pleaded not guilty but, although the motive of his crime was never actually discovered, he was eventually convicted of having mixed datura seeds in a curry, thereby stupefying a Malay constable, his wife, and their niece, and a girl friend, as well as two men, all of whom happened to eat of the same dish. The symptoms in each case were similar, namely, attacks of giddiness, passing into unconsciousness for a few hours, followed by complete recovery. This group of cases is of some interest, owing to the fact that one of my colleagues, who appeared for the prosecution, was able to give evidence of a very practical kind. A sample of seeds and powder which had been found in the prisoner's handkerchief was sent to Dr. D. H. McClosky for identification. I am indebted to him for the following notes of his personal experiment. He says: "I took pinch doses of the sample, which consisted of the bruised seeds, and had the following experience: I felt flushed, dry about the mouth and throat, and became hoarse. When I tried to walk I staggered about like a drunken man and got very excited. I then took an emetic of zinc, vomited, and slept for about five or six hours." Dr. McClosky is further said by an eye witness to have been in a delirious state, rolling on the floor, and uttering inarticulate cries.

Case II. *Datura Seeds mixed in Food by Pathans.*—In February, 1900, a Pathan was found by the roadside in Kuala Lipis, and brought to the hospital about midnight. He was half conscious, very restless, had dilated. pupils, and was supposed to be intoxicated with alcohol.

Mr. Henry Philips, the chief dresser, who saw him the next morning, fortunately suspected datura poisoning. He applied the stomach pump, and found datura seeds together with partially-digested rice and green peas in the gastric contents. The patient made a complete recovery, and two of his fellow countrymen were subsequently sentenced to rigorous imprisonment for having administered the poison with intent to facilitate robbery.

Case III. *Datura Seeds mixed in Tea by Kedah Malays.*—At Kuala Kuantan, in July, 1901, two natives of Kedah were tried at the assizes and found guilty of administering datura seeds to a party of Chinese. Five different preparations of datura were found in their possession, some of which had been successfully used to produce unconsciousness in three Chinese, whose goods had then been stolen from their shop. They had been administered in tea and the stupor produced lasted apparently for several hours. The Chinese recovered without treatment. They stated that they had suffered from dryness of throat, uncertainty of vision, and "drunkenness."

Case IV. *Datura Seeds mixed in Tea by Chinese.*—In January, 1902, a family of Japanese in Kuala Lumpor, consisting of a man and his wife and son of about 10 years of age, were poisoned by datura seeds, which had been administered, as far as could be ascertained, in tea by a Chinese cook. I am indebted to Dr. Travers for the following brief and excellent notes: The man and the woman had flushed faces, bright eyes, dilated pupils, and suffered from giddiness. The man felt hot, dry, and parched in the throat, and had uncertainty of vision. The woman was semi-conscious for a time, and kept picking at imaginary objects. Both recovered by the aid of emetics. The effect of the poison on the boy was more severe. About one hour and a-half after taking it he was seen rolling about the floor; he crawled, but could not walk without falling. He kept uttering inarticulate cries not unlike the mewing of a kitten, and appeared to be in a state of delirium with flushed face and dilated pupils. He could not be induced to swallow anything, and gradually became very excited. He then fell into violent fits of temper, struck at imaginary objects, and was delirious all day, from 7 a.m., but slept soundly at night, and had completely recovered by the next morning. Dilatation of the pupils was very marked and persistent. It is noteworthy that in this case the drug was given on an empty stomach. The tea in which it was administered was the ordinary weak infusion of Chinese tea which is used every day by natives in the Federated Malay States.

Modes of Administration.

The favourite mode of administering the drug for criminal purposes is by the mouth, the raw seeds being commonly used. In the Federated Malay States they are generally crushed and put into ordinary tea or into the common food, which is some form of rice curry. Cases have been known, however, of the seeds being mixed with other poisons, such as *chandu* (opium prepared for the pipe) and *ganja* (Indian hemp), with the addition of a little sugar.

It is also, perhaps, worthy of note that they are sometimes mixed with other substances which are commonly supposed to be poisonous. For example, one of the exhibits in the Kuantan trial (Case III) was a carefully-prepared powder of datura seeds mixed with the fine hair of the young bamboo shoot (*miyang rebong*); *kulat taun*, a kind of toadstool; *gadong utan*, a wild yam (dioscorea daemona); and the fruit of the *rengut*, a climbing plant (epipremnum giganteum, Schott). These were all in dry powder, and being inodorous were in a form calculated to escape observation when mixed with food. In Pahang the seeds have been burnt with *gaharu* (aquilaria malaccensis), an incense wood well known as lign-aloes, also with *dama mata kuching*, a common local resin, for the purpose of producing lethargy by means of the fumes, and in the Temerloh district I have known of two cases in which this state was successfully produced in the victim with the object of profligacy or plunder.

POISONOUS EFFECTS.

The three most characteristic symptoms of poisoning by datura are the same as those of poisoning by atropine, namely :

1. Paralysis of the salivary nerves, leading to dryness of the mouth.
2. Paralysis of the third nerve, causing dilatation of the pupils, with imperfections of vision.
3. Paralysis of the inhibitory fibres of the vagus in the heart, causing sometimes very rapid action of the heart.

Other effects which should be noted are—that when the seeds are given internally (and the professional thief appears to know the exact dose necessary) symptoms of insensibility may commence early—within a quarter of an hour).[1] The effect of the drug may last for two days, and is more severe, as a rule, if it is administered during childhood and old age. Many fatal cases of poisoning by the fruit and young seeds of datura are reported by Chevers,[2] as well as five fatal cases of poisoning by the leaves. They are mostly in children and aged persons.

Excessive dilatation of the pupil may be regarded as a dangerous symptom in datura poisoning. The loss of power of accommodation which is thereby produced, and the hallucinations caused, may explain the disorders of vision which are so common. There is also a certain degree of impairment of memory before complete recovery.

In India this after-effect has been regarded as one of the causes of insanity, and it seems not at all improbable that slow or chronic poisoning by datura would tend to weaken the intellect. In absence of any suspicious circumstances the differential diagnosis of datura poisoning may be difficult. As with atropine, the symptoms of daturin poisoning have occasionally been confounded with those of rabies, delirium tremens, and mania.

Native Therapeutics.

The datura plants are generally recognised as being poisonous. The leaves are almost universally used in the treatment of asthma, but it is significant to note that datura is not often given internally as a remedy by natives. The Malays mix leaves with urine or powdered rice and saffron and apply them externally for various pains and swellings. They will heat them over a torch until smoked, and then apply them as a poultice over the spleen in intermittent fever. The root is powdered and applied to the gums in order to relieve the pain of toothache. The flowers are dried and roughly powdered with or without the leaves and rolled into cigarettes for the relief of asthma.

An instance of alarming narcotism from the application of D. stramonium leaves to an extensive burn is recorded by Christison; but although datura is frequently used as a therapeutic agent for local application, I have never heard of a similar accident in Malaya. It may be of interest to remark that datura is highly prized by Malays, all parts of the plant being used and valued; an infusion is often employed by agriculturists as a dressing to prevent the destruction of the young padi (rice) plant by insects. The datura, or "devil's trumpet," is regarded as a good medicine by Tamils, and is often used by them in the Federated Malay States, but generally as an external remedy. They are fond of applying the leaves with cow dung in the form of a poultice to relieve the pain of boils, carbuncles, and piles, and also use them in powder mixed with "ghee" (clarified butter) in their treatment of facial neuralgia and dogbite, or steeped in spirits as a lotion to promote the growth of the hair. They are said to administer the powdered root in cases of epilepsy and insanity.

The dried flowers of datura alba (called *Nau yeung fa*) can be bought in most Cantonese drug stores, where they are frequently dispensed for the relief of asthma and chronic dry cough, but the use of the seeds seems to be eschewed by the Chinese druggist.

TOXICOLOGY.

So far as is known at the present time the active principle of the datura plants is a mixture of a kind of atropine and hyoscyamine. The term "daturin" has been applied to this mixture, but the true nature of the component alkaloids has yet to be finally determined. Schmidt properly insists on speaking of stramonium atropine as contrasted with belladonna atropine; because, although chemically identical, some difference may be recognised both in their physiological and therapeutical actions.[3]

The medicinal dose of daturin has been given as $\frac{1}{2}$ mg. to 1 mg., or $\frac{1}{120}$ gr. to $\frac{1}{60}$ gr.,[4] but it is difficult to say from the reports of fatal cases by datura poisoning how much daturin will constitute a fatal dose in any given case.

With regard to clinical experience of poisoning by the closely-related datura stramonium seeds, a child has died in twenty-four hours after swallowing a dose of 16 gr. (128 seeds), although 20 seeds had previously been dislodged by vomiting, and 80 by purging.[5]

Luff states that about 100 seeds form a fatal dose, death occurring in seven hours.[6] Taking the mean of the proportions of the total alkaloid stated to be contained in the seeds by Squire[7] and by Gunther[8]—namely, 0.5 per cent. and 0.318 per cent. respectively—this is equal to about $\frac{1}{25}$ gr. of the alkaloid daturin. The whole plant is said to contain the active principle in the proportion of only $\frac{1}{50}$ per cent.[10]

Seventeen or 18 gr. of the official extract of stramonium seeds (dose, $\frac{1}{4}$ to 1 gr.) have caused death.[6] Recovery, on the other hand, has occurred after the vomiting of more than 100 seeds.[9]

Recent Chemical Experiments.

Important points to discover are :

(*a*) The amount of poison which is present in the common daturas of the Federated Malay States.

(*b*) The relative degree of strength of the poisonous principle in each.

(*c*) The difference, if any, between the daturin contained in D. stramonium and that contained in D. fastuosa and D. alba. I have attempted to elucidate this by examining both the fresh plants and the dried seeds. The experiments were made at the Institute for Medical Research at Kuala Lumpor. I am greatly indebted to Dr. H. E. Durham for the results that have so far been obtained by them, and have much pleasure in expressing my appreciation of the valuable experience which his kindly instruction has afforded me. It was found that the mixed alkaloids could be easily removed from an ammoniated extract by shaking out with benzol. In the case of a full-grown datura alba plant which was treated in this way, the refuse remaining after extraction by benzol was found to have no further mydriatic effect on a cat's eye, and had no poisonous effect when given in large doses to a puppy. It was therefore concluded that the whole of the active principle had been removed by means of the benzol. Want of time and opportunity prevent me from making further experiments in this direction, but I hope to resume my investigations on account of the great importance of this branch of the subject.

Datura Poisoning ; Treatment.

Cases of poisoning by datura are generally treated by more or less time-honoured methods. It has been proved, however, that implicit reliance cannot be placed on emetics, and the early administration of a purgative is often advisable. Daturin is precipitated by tannic acid; and the use of any decoction containing tannin, such as tea or coffee, which is strong enough to destroy the active principle, may be of value. Like atropine, it is excreted from the system by means of the kidneys.

Opium administered by the mouth or through the rectum, the various salts of morphine, pilocarpin, and chloroform inhalations have been given successfully in cases of stramonium poisoning, but no chemical antidote by which daturin has been decomposed in the animal economy appears to have been either used or suggested up to the present time.

Nevertheless, there is reason to believe that we possess an efficient antidote in potassium permanganate. Potassium permanganate has the important chemical property of oxidizing the vegetable alkaloids, and has been used with success in many cases of opium poisoning. This salt may be introduced into the stomach without danger in solutions not stronger than 1 gr. to the oz. Washing out, therefore, by means of a tube with a dilute solution of this strength appears to be indicated so long as any datura remains in the stomach.

Experience alone can settle the question as to whether the potassium permanganate will be of any therapeutic use after daturin has been absorbed into the system, but as the action of the poison is doubtless prolonged, especially when taken with large quantities of food, we should expect that repeated small doses would be of great value in many cases.

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British Medical Journal, 1903, *Volume i.*, *page* 1137.

NOTES ON SOME METHODS EMPLOYED BY KELANTAN MALAYS IN THE TREATMENT OF PURU OR YAWS.

THE communication which I have the honour of making to the Therapeutical Society is based on notes which I have made from time to time on yaws, as it occurs in this part of the tropics. A period of over seven years' service in the Government of the Federated Malay States has afforded ample opportunity for observing yaws or "puru," the latter being the name given to it by natives of the Malay Peninsula. A further and better opportunity for observing this disease under purely native conditions has been afforded me during the last year by a residence in the interior of Kelantan. The State of Kelantan is north of Pahang, and approaches Siam, being in geographical position between 5° 40′ and 6° 20′ N. lat. The country until quite recently has been administered by a native Malay Rajah.

Puru is very common both in the towns and villages of Kelantan. It belongs equally to the native palaces and to the poorer dwelling-places. The disease is identical with that so clearly described by Charlouis as occurring in the islands of the Malay Archipelago.* The identity of puru with yaws has been pointed out by Barker, of Borneo.† It is not necessary therefore to review, in this Paper, the mass of evidence which proves the identity and which adds so many other native names to the nomenclature of frambœsia or yaws.

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* Charlouis. Selected Essays. New Sydenham Society, 1897. London. P. 285.

† "Tropical Diseases," by Manson. Revised Enlarged Edition, 1900. Cassell & Co., Ltd., London. P. 455.

The disease is spread all over the Federated Malay States, viz., all over Perak, Selangor, Pahang, and Negri Sembilan. It is chiefly confined to the Malay population, being especially common among children in the less civilised of the states, *e.g.*, in Pahang.

So far, its prevalence has not attracted much attention from the Government of the Federated Malay States. This is probably owing to the fact that it does not interfere much with labour (which is mainly carried on by Chinese), and, speaking generally, it does not permanently injure the health of the Malay community. Death from an ordinary attack of puru is almost unknown.

As in other tropical countries in which this disease is prevalent, an attack of puru or yaws is generally considered, by the inhabitants, to be a salutary experience for their children. Inoculation is not, however, practised by Malays, and although the high degree of contagion is well known to them, isolation is never thought of, but natives will avoid personal contact with the discharges of yaws, and do not care to eat rice with people who may be afflicted with the general eruption. The chronic sores of the foot (puru duriyan)—the so-called " durian sores " of Kelantan (known as " bubul " in the other states)—are not considered to be infectious, but Malays are careful to bathe up stream or away from people who are engaged in washing either their sores or those of their sick children at the time.

There is a belief amongst some of them that the blister caused by accidental contact with the " getah " or fresh sap of a common local jungle tree called pokoh machang, the horse mango (mangifera fœtida), is a ready vehicle for infection by puru should there happen to be cases of the disease in the neighbourhood. These trees are sometimes avoided in consequence, especially in August, when they are in fruit, except by those who think that they may have secured immunity owing to repeated attacks of puru in childhood.

In the early stages of the disease the only native form of treatment employed for the relief of the prodromal fever and muscular pains is the superstitious Malay practice of "menjampi" or charming by incantations. It is held by Malays that active treatment is of no avail until the full development of one or more puru sores has been attained. The sore which is so often watched, with the object of timing the commencement of treatment, is known to them as the "puru ibu" or mother sore. When this so-called parent sore has developed, their most valued remedy is the external application of a latex or kind of gum which is called "getah agu" in Kelantan, and "getah jintan" in Pahang, Malay. This is obtained from a climbing jungle creeper known in Kelantan as "akar agu" (akar, lit. a root, the generic for scandent or creeping plants). The agu plant grows wild. It is very like Hunteria corymbosa, but is uncommon. It is prized by Malays, and like many other of their medicinal plants, is protected and cared for. A red variety is especially valued. The latex is obtained by cutting the live stem, mixed with water to allow for its inspissation, and may be bought in this form in the native market at Kota Bharu. The remedy is smeared, day by day, on to the sores of the general eruption. So far as my limited clinical experience in Kelantan goes, "getah agu" causes the sores of puru to shrink, and is of value as a local application.

Another latex which is valued is obtained from a jungle creeper called "akar gam." In this case the remedy is obtained by incising the fresh fruit, but it can also be procured by incising the stem. It is generally known under the name of "buah gam" (buah, lit. a fruit), and is commonly applied to the sores of puru in the same way as "getah agu." In some cases in which the sores are chronic and do not respond to treatment, "buah gam" is applied in a different way. The dry fruit is roasted, then powdered, and finally made into a paste with a little water. In other cases of chronic and recurring sores the ashes obtained by burning the stem of "rotan sega badak" (calamus ornatus) are used. Rotan in Malay is a generic name for rattans of the genera calamus and dæmonorops.

Another local Malay remedy is well known under the name of "terosi." This is sulphate of copper. In the general treatment of puru "terosi" is reduced to powder and then mixed either with palm oil or with a latex called "getah pulai." "Getah pulai" is obtained by cutting the stem of the young Pulai tree. This is a large jungle tree (Alstonia scholaris). External applications of this kind containing "terosi" cause a great deal of pain. They prevent sleep and are not often used on this account, rarely if ever being employed in the early stages of puru. With the object of preventing pain these applications are sometimes prepared by first burning the "terosi" in a slow fire until it is blackened; then pulverising and mixing into a paste by means of the juice of the common lime fruit—limau nipis (citrus acida).

A more important drug, for sale in the Kota Bharu market, is "tebah tikus" (tikus, a rat), which, like "terosi," is imported viâ Singapore. "Tebah tikus" is pure arsenious acid or "white arsenic"; it assumes rather odd forms which are probably due to its having been collected from the flues of some dyeing works. It is used externally in the treatment of puru, either by itself, in the form of a powder, or as an addition to various kinds of roughly made "pastes" which are prepared from certain native plants. These vegetable "pastes" are freshly made as occasion demands; in one instance by grinding down with a little water the root of a wild, red vine called in Malay, mali puchok merah, a plant which is identical with Leea rubra (merah, lit. red), and in another case by treating, in the same way, the root of a low shrub called chekor manis (Sauropus albicans). Manis is the Malay for sweet or light in reference to some colours.

"Tebah tikus" is used as a poison by criminals, but it is not administered internally as a medicine by Malays. It is the "berangan puteh" of Java, being probably brought from Siam or Burma. The sulphurets, orpiment and realgar are also used in puru; but all the external applications containing arsenic being caustic are much disliked on account of the pain which they occasion.

Mali puchok merah is given by the mouth for puru as well as being used externally, and among other internal remedies are melor hutan, a wild jessamine (Jasminum bifarium—Oleaceæ), and the black variety of kemantu. This latter is a tree of Indian origin (Clausena excavata). It is called pokoh kemantu hitam or the black kemantu tree, pokoh meaning a tree in Malay, and hitam black. There are other varieties of this tree which are not used in medicine. Akar jelar batu is also administered internally for puru. In each case the roots of these plants are ground down on a "batu asah") a stone on which medicines are pounded or ground down) and then infused in cold water. There is no fixed dose. Occasionally a mixed infusion is used in puru of kemantu hitam and tuko takal (Baccaurea Wallichii Euphorbiaceæ), a jungle tree which is fairly common.

Various applications are made for puru of the foot. The following method of treatment, known as "tanak puru" (tanak, lit. to cook), is a favourite one with some Kelantan Malays. A small round hole about a foot depth is made in the ground and a slow fire is kindled at the bottom of it; half a cocoanut shell with a hole in it, or a suitable piece of bamboo, is then fitted over the red hot embers. The affected foot is rested on the top of this improvised screen in such a way as to expose the sore to the heat of the smouldering fire. Kemantu leaves are often put on the fire as well as those of

Kedondong, a tree belonging to the genus Canarium. The bark of the latter is sometimes burnt on the embers in addition to the leaves. Relief of pain is obtained after three or four lengthy exposures. Lime is also a popular remedy for puru of the foot. It is mixed with oil or with the juice of "keladi puyoh"—a common Malay aroid of the genus Alocasia (Typhonium Roxburghii). Stones may be heated and applied as hot as can be borne. The actual cautery in the shape of red hot iron nail is occasionally used, and even excision is attempted by means of "parangs" or the rough iron choppers which are usally used by natives in felling trees.

It is of general interest to note that the drugs used in puru are not used by Malays in their treatment of syphilis. Syphilis is universally believed by them to be entirely distinct from puru. In Kelantan, syphilis is well known, being recognised under the local term of "seduwan sundal" (sundal, lit. a barefaced harlot). The chief Malay drug used for syphilis is pokoh restong (Tabernæmontana corymbosa). Pokoh restong grows wild, but is often cultivated; it is praised by natives as being a valuable medicinal product. The root is used and mostly in the form of a lotion, especially in cases of ulceration and destruction of the nose. It, as well as "trong pipit puteh" (Solanum indicum), is also given internally for syphilis, but neither of these is employed in the treatment of puru or yaws. Trong is a Malay word used to designate the plants of the Solan aceæ (puteh, lit. white).

In conclusion, the apparent influence of vaccination as a preventive method of treatment must be mentioned. It has been noticed by the Malays in Pahang. Although Keelan,* from experience in Dominica, has referred to the apparently favourable connection between yaws and vaccination, his suggestions do not appear to have entirely fallen in with the views of other West Indian observers, but still, at first sight, the incidence of the disease as it occurs in the Malay Native States seems to support his original ideas. Judging from the scars of "puru ibu," which are as well remembered by Malays in after life as vaccination marks by Europeans, puru has evidently been prevalent in Kelantan for many years.

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* Keelan. *Lancet*, 1876. Vol. ii, p. 201.

It is significant to note that vaccination has never been attempted on any large scale in this uncivilised State. In the advanced States of Perak and Selangor, on the other hand, where the mixed populations are now more or less thoroughly protected by vaccination from small-pox, yaws is becoming comparatively uncommon. Puru, again, was very prevalent in the State of Pahang nine or ten years ago, but since then a marked decline has been observed. Prior to 1896, there were only thirteen cases of vaccination recorded in the Pahang annual medical reports. At the present time the registered number has probably far exceeded 20,000 cases. The Malays of the Federated Malay States now believe in vaccination. They often attribute an apparent immunity of Europeans to puru to the fact that, speaking generally, all European residents have been well vaccinated in childhood. This view is probably erroneous. There seems to be a better reason. Dr. C. W. Daniels (the Director of the Institute for Medical Research, Federated Malay States) tells me that European children of the lower classes mix freely with native children in Fiji and in the West Indies. They are in this way directly exposed to the contagion and often suffer from yaws in consequence. It would be quite exceptional, on the other hand, for European children to have many native playmates in places where puru is common. Good opportunities for mixing freely with children of their own age in the native towns and villages of Malays are seldom given them. It is more practical to account for the apparent immunity of Europeans to puru by explaining that they are not really very much exposed to the contagion. As a matter of fact, most Europeans are rather prone to avoid contact with this loathsome disease.

Referring again to the alleged influence of vaccination, it must also be borne in mind that it has not yet been actually proved to exist in the other warm climates in which yaws is common; and it must be remembered that the principles of sanitary science have been introduced by the Government of the Federated Malay States, coincidently with the introduction of vaccination into the older States of Perak and Selangor, and extended more recently into the State of Pahang. The intrinsic value of vaccination, if any, as a preventive to the occurrence of the disease in Kelantan, where the people are ignorant of the principles of modern sanitation and are exposed to epidemics of small-pox, remains yet to be seen.

I am much indebted to Mr. R. W. Duff for his kindness in helping me to prepare these notes, and to Ungku Saiyid Hussein (a Malay noble) for his cordial collaboration. Botanical specimens of most of the plants referred to are sent to England with this Paper in the hope that they may be of interest to the Therapeutical Society. They have all been obtained in Kelantan; most of them from a hamlet—Kampong Kutan—near Kota Bharu (the capital), others from different parts of the State. These drugs are used empirically, and, speaking generally, are well known to most Kelantan natives, but Malays are naturally reticent, and it is not easy to win secrets from the native "pawangs" (witch doctors) or to obtain information from the "bomors" or medicine men by which to differentiate their particular therapeutic virtues. I am indebted to Mr. H. N. Ridley, F.R.S., the Director of the Botanic Gardens, Singapore, for his kindness in classifying the plants, and to Mr. P. Burgess, M.A., Government Analyst, S.S., for his examination of the mineral known as "tebah tikus" or ratsbane.—*Therapeutical Society's Transactions*, 1906, *page* 123.

BERI-BERI; MOULDY RICE: THE OCCURRENCE OF BERI-BERI IN THE SOKOR DISTRICT.

The inference that beri-beri, as it occurs in British Malaya, is due to mouldy rice was taken some years ago as the basis of an argument by Mr. Leonard Braddon, F.R.C.S., State Surgeon of Negri Sembilan, in the Federated Malay States [1]. It excited a good deal of local discussion at the time, and the mouldy rice theory was again lately revived by Dr. S. Lucy Colonial Surgeon, Penang [2], and still more recently urged by Charles Hose, Esq., D.Sc., Divisional Resident of Sarawak, in North Borneo [3].

It is a theory, and there are many who are not satisfied with the circumstantial evidence which has been brought forward to support it, while there are others, notably, Dr. E. A. O. Travers, State Surgeon of Selangor, who have decidedly disagreed with Mr. Braddon's original contention that the probable cause of beri-beri is a toxin conveyed in certain forms of rice [4].*

The following notes were taken in the interior of Kelantan, a distant State in the Malay Peninsula, about 350 miles north of Singapore. Three years ago mining operations were commenced in Kelantan by a British Syndicate which was soon formed into a large Company, to which I was appointed the first resident medical adviser. The native State of Kelantan had not hitherto been explored by any European miners.

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* Many others who have spent years in exhaustive research work on beri-beri have entirely rejected the rice theory. The cause of beri-beri however, has not yet been definitely proved by them to Science, and for this reason I think that any new evidence which appears to support the rice theory is worthy of their attention.

It was therefore a typically new country, with new mines, and, beri-beri being such a well-known local scourge among Chinese, some anxiety was felt in the early days of the Company as to the health of the newly imported gangs of coolies that were necessary to carry on the work of underground mining.

Chinese labour is universally employed for this purpose in the Malay Peninsula, but, curiously enough, this mining district in Kelantan (afterwards referred to as the Sokor district), remained at first remarkably free from beri-beri. No cases were diagnosed in 1903.

Mining operations were commenced in the interior of Kelantan, in a valley some seven miles distant from a small station on the River Sokor; the general welfare of the Company's coolies was quite as well, if not better, cared for as compared to that in similar mining districts; the meteorological conditions—all very favourable to the formation of moulds—were found to be more or less the same as those in other parts of the Malay Peninsula; the coolies were fed upon imported Rangoon rice, as is customary in other mining camps in this part of the world.

Rangoon rice is more liable to be attacked by moulds and weevils than any other kinds of imported rice [3]; it is also more difficult to clean for cooking as it soon becomes broken in the necessary process of kneading and washing, but it is cheap and is in common use. The supply was mainly obtained by the Company from Singapore, because the conservative Chinese do not care to purchase rice which is grown locally and only roughly husked by indolent Malays for retail; moreover, the Company had endeavoured to store Kelantan rice, but found that this was impracticable, as it very quickly deteriorated after it had been husked by hand and stored.

As there was no market in the Sokor district it was necessary to stock a comparatively large amount of rice for the Chinese miners; this was all kept, at first, in a small store at the river station in bags, each of which generally contained from 1 to 1½ pikuls of rice. The pikul is a Malay measure of weight in everyday use; it is approximately equal to 133¼ lbs. avoirdupois, and is divided into 100 catties, each catty roughly corresponding to 1⅓ lbs. avoirdupois.

Why Rice Deteriorates.

These large bags were all piled in a small space, one on top of another to a height, and being fairly heavy were difficult to interchange. When a large supply of rice came in, the new bags were invariably placed on the top of the old pile. This was unfortunate, as was afterwards proved, because, long before the delivery of the rice on the bank of the river Sokor it was exposed, as rice in the husk, to deterioration through damp. The writer of an article on "A Trip to Burma," recently published in the local press, says, when describing the railway journey from Rangoon to Mandalay: "A resident of the country told us that the paddy owners often had to wait a month before the railway could take their grain. We saw stacks and stacks of it—in bags—lying out in the open alongside the line near railway stations" [5]. The rice is shipped from Rangoon to Penang, and from there to Singapore.

Dr. Lucy also mentions that when large consignments of this rice to the Straits Settlements coincide with an interval between the crops in Rangoon, the only supply at these times is of an inferior quality left over from the last crop. Such an interval occurs in October. As regards Kelantan, delays occur in shipping from Singapore, as well as delays and boating accidents on the Kelantan rivers, especially during the violent weather of the North East monsoon season, which is mostly felt during the months of November, December and January.

Local means of communication with the Sokor district, again, are very slow; under ordinary circumstances six or seven days are taken in transporting cargo by river boats to the headquarters of the Company, located about fifty miles inland from the coast; from there it has to be transhipped into much smaller boats for transport up the river Sokor, which is a small stream in the adjoining Sokor district. Another four days would be taken before it was finally distributed in the mining camp, making a fortnight from Singapore even in good weather.

Some idea of the bad weather during the North East monsoon season may be gathered from the records of rainfall in Kelantan. The rainfall in the Sokor district was 27·99 inches in December, 1904; 17·42 inches for the month of November, 1905; 10·97 inches in December, 1905, and 28·48 inches for January, 1906.

Mining coolies or their contractors obtained rice, from time to time, in small quantities by means of an order in writing on the clerk in charge of the river store and carried it through the jungle to the mine. There was a tendency on the part of the contractors to apply for large quantities of rice at the beginning of the month, but it could not always be delivered to them then, on account of occasional difficulties with the jungle transport. Their applications varied according to circumstances, and their only means of supply was through the river store. The main rivers in Kelantan may rise to a height above 30 feet during the wet weather, and there are then corresponding floods in the smaller streams, such as the Sokor river and other small rivers in the district. Good judgment was therefore essential in order to keep a fair balance between the supply and demand for rice at the river store. The native clerk in charge of the store was an intelligent Sumatran who was appointed in 1903.

PREVALENCE OF BERI-BERI.

Little concern was felt as regards beri-beri during the greater part of 1904, although the number of Chinese workmen was greatly increased. There were, for instance, only eight cases of this disease registered, with two deaths, a mortality which was trifling when compared to an appalling death-rate of 79·99 per cent. (187 deaths out of 234 cases), as I had known it in one of the mining districts of a neighbouring State [6].

Towards the close of the year, however, the general health of the Sokor district was far from satisfactory, malaria was very prevalent in the mining camp, which had always been topographically unfavourable to health. Special attention was accordingly paid to sanitation, and some expense as well as much trouble was incurred in trying to render the camp more healthy, but it was, nevertheless, unsatisfactory to report, at the end of June, 1905, that a number of cases of beri-beri had occurred. There had been 37 cases with 7 deaths.

The coolie gangs had been increased by about 100 men as compared to 1904, bringing the whole strength up to 400 Chinese. Among them were a number of inexperienced new comers from Singapore, who had been engaged by a Chinese contractor in May under conditions similar to those of the "Singkheh" or indentured Chinese labourer of the Straits Settlements.

The bad health of the "one year contract Singkheh" is notorious in the Malay Native States, and these new arrivals in Kelantan suffered, as might have been expected, considerably more than older "Lowkhehs" or time expired Singkhehs would have done. Twelve of them died from various causes in a very short time, six of them from beri-beri in July.

Many of these untrained Chinese were lodged in some newly-erected coolie lines, and it was thought at the time that they were being affected by reason of a somewhat extensive disturbance of the soil which was found necessary when erecting their buildings. As beri-beri has been thought by some to have an indefinite connection with disturbance of the soil in the Tropics [7], stress was laid on this fact; greater attention was paid to sanitation; old buildings were destroyed; the ventilation and hygiene of the camp generally improved, and overcrowding prevented as far as possible.

The principles of sanitation in the Tropics were now very strictly enforced, and at the end of the year a great diminution in the prevalence of malaria was the result, but it was vexatious to find that there had been 68 additional cases of beri-beri with ten more deaths from this disease. The incidence of the outbreak is shown in the attached table A.

TABLE A.

SHOWING THE INCIDENCE OF THE DISEASE IN 1905.

Months	New Cases	Deaths	Nationality			Treated in Hospital	Treated as Out-patients
			Chinese	Javanese	Malays		
January ..	6	5	2	4	..	5	1
February ..	..	1	..	..	..	..	..
March ..	2	..	2	..	..	..	2
April	1	..	1	..	..	..	1
May	10	1	9	1	..	4	6
June	18	..	17	1	..	7	11
July	28	6	28	..	..	8	20
August ..	10	1	10	..	..	..	10
September ..	4	..	4	..	..	..	4
October ..	5	..	5	..	..	..	5
November ..	9	2	9	..	..	1	8
December ..	12	1	7	..	5	1	11
Total ..	105	17	94	6	5	26	79

With regard to this table it is important to note that the total strength of the mining coolies was reduced by more than one half during the last five months of the year. The reduction began in August, and by the end of the year there were only about 100 Chinese miners left at the works. Under the heading "new cases" only different individuals are included; the death which occurred in February was a case which had remained over from January. It is only of passing interest to notice that, as regards seasonal prevalence, by far the greater number of cases occurred during the months of the south-west monsoon, namely, from April to September inclusive. The greater number of coolies were employed during these months. The influence of the north-east monsoon on the supply of rice will be seen later.

The incidence of the outbreak was characterised as follows: in January it occurred in the acutest form of the disease, all the cases died. In the second week there were three sudden deaths within twenty-four hours. The outbreak was mainly confined to the Javanese who were employed as timber cutters, 33 in number, and was so unexpected as to arouse the private suspicion that the patients had been poisoned by their contractor for the purpose of gain. The cause of their deaths, however, was investigated, and all the cases were registered as due to acute beri-beri.

In May an equal number of cases occurred in each half of the month; the same happened in June, but in July, when the disease was at its height, 18 cases out of the total occurred in the first half of the month. The total Chinese strength was then also at its maximum. In August, 8 cases occurred in the first half of the month, and in November again 5 in the first half of the month. In December, it attacked the Malays for the first time and was seriously affecting the Chinese; of the total number treated 9 applied again for relief during the first half of the month. The death rate for beri-beri in 1905 was 16·19 per cent. for cases treated, the greatest mortality occurring in January, July and November. In every instance the disease was of the so-called wet variety; the chief clinical features of the cases which were fatal during January, July and November are shown in table B.

TABLE B.

SHOWING THE CLINICAL FEATURES OF THE FATAL CASES IN 1905.

Date, 1905	Nationality	Subjective Symptoms	Died, 1905
Jan. 1	Javanese ..	Slight previous fever, weakness, orthopnœa, sudden cardiac pain and vomiting	Jan. 14
,, 1	Javanese ..	Admitted for ulcer of leg, swelling of legs and body followed, died suddenly	Feb. 20
,, 13	Ch. Kheh..	Debility, shortness of breath, swelling of legs and face	Jan. 14
,, 14	Ch. Kheh..	Sudden severe cardiac with hepatic pain and orthopnœa	,, 14
,, 18	Javanese ..	Previous fever, weakness, swelling of whole body and extremities, sudden cardiac pain	,, 29
,, 31	Javanese ..	Anæmia, debility, dyspnœa, tenderness of legs, with sudden cardiac and hepatic pain	,, 31
June 28	Ch. Kheh..	Previous fever, numbness and tenderness of legs, with general œdema	July 8
July 1	Ch. Hailam	The same as above	,, 7
,, 2	Ch. Hailam	The same as above	,, 15
,, 5	Ch. Kheh..	The same as above, with hepatic pain	,, 9
,, 10	Ch. Hailam	The same as above	Aug. 14
,, 24	Ch. Kheh..	Second attack, great cardiac pain and dyspnœa, died suddenly	July 24
Nov. 2	Ch. Kheh..	Previous fever, swelling of whole body and dyspnœa	Nov. 9
,, 24	Ch. Hailam	The same as above, with greater swelling	,, 24

The date in the table above refers to the day on which the patient first applied for relief.

ASSIGNED CAUSES OF BERI-BERI.

It was part of my duty to visit the Sokor district twice every quarter, and to leave a written report before returning to headquarters. The importance of improved sanitation as a check to beri-beri was frequently referred to in my reports, but the possibility of mouldy rice being a vital factor in connection with the disease was, unfortunately, overlooked until the last month of the year. In the second week of March, however, I examined the diets of the Javanese and reported that their rice was of good quality, but not sufficiently cooked. The Chinese themselves in the Sokor district do not regard mouldy rice as even a probable cause of beri-beri ; on being questioned as to the cause they almost invariably refer to exposure to the very cold water in the underground workings or to the drinking of bad water.

The Sokor district hospital is in charge of a Chinese dresser (corresponding in rank to the Indian hospital assistant); this dresser was specially chosen in 1904, partly on account of his experience of beri-beri. He had formerly been in the F.M.S. Government Service under me, and was, at that time, stationed in the mining district, where the death rate from beri-beri was as high as 79·99 per cent. of cases treated.

Late in December he called my attention to the diet which was then in everyday use in the camp, and collected, on December 20th, samples of the rice which was being prepared for the meals in the coolie lines on that day. I examined and found that these samples were full of the live larvæ of a small light brown moth and that the grains of rice were clotted with excrementitious matter. The worst sample was one taken at the coolie lines occupied by some Chinese miners under contract to a Hailam named Ah Juan. This contained, in addition, a few small beetles, as well as the well-known rice weevil, *Calandra oryzæ, L.*

At the coolie lines the Chinese cooks were trying to clean this rice by hand after drying it in the sun, and then washing by kneading it, by means of their feet, in perforated empty kerosine tins. As soon as it was sufficiently clean to the naked eye it was cooked in the usual way, that is to say, it was put into a large iron cooking pan (a kwalli), containing boiling water, stirred and boiled until it was cooked and then finally allowed to steam under the cover for about half an hour, when it was ready to be eaten either hot or cold. Water for washing and cooking was obtained from a small stream running through the camp.

Three of the Chinese cooks employed contracted beri-beri, one in the month of May, one in August, and another in October, each after about two months' work in the coolie lines. These cooks were, as is characteristic of their race, mixing good rice with the bad in order to deceive the coolies. They cooked rice twice a day in accordance with the usual Chinese custom; it was their staple diet, meat being seldom eaten.

It is important to note here, that all the rice at the river store had, at the close of the year, been transferred to a new store house which had lately been built at the mine. The river store house, only 13 feet by 18 feet and about 10 feet in height, had become too small. The rice was transferred from there during the months of September, October, November and early in December, the fresh supply of rice for December being carried direct to the mine. As soon as the bad rice was discovered in December, an examination of all the rice in the new store was held, and it was reported that a large quantity of it was unfit for consumption. I saw that most of it was infested by the same kind of worms and insects mentioned above, but by careful winnowing more than half of it could be rendered, to all intents and purposes, similar in appearance to good rice. There were several bags also in which the rice was greenish, sour-smelling and distinctly mouldy; the sacking was caked inside with rice which had obviously decayed owing to exposure of the bags to water.

DETERIORATED RICE AN APPARENT FACTOR IN THE ETIOLOGY OF BERI-BERI.

It is now of interest to try and trace the connection, if any, between the occurrence of beri-beri in the Sokor district and the variation in quantity of fresh rice supplied from the local store, and I think it will be admitted that this particular outbreak appears to have been coincident with the use of deteriorated rice.

In the year 1904, all the eight cases of beri beri occurred in the first two months of the year, one in January and the other seven in February; they were all Chinese, the one in January died suddenly and another almost suddenly in February. At this time the coolies, who were for the most part newly arrived Hailam miners, were working on the top of a high hill, which caused their local means of communication to be even a little more difficult than was usual. Five of the 8 cases occurred among the Hailam miners; they had all eaten deteriorated rice.

At the end of 1903, there were 119.24 pikuls of rice in the river store, much of which must have been at the bottom of the pile for some time, no fresh rice was received in January, 1904, but 60.58 pikuls were issued, leaving 58.66 of the original balance from 1903; in February, only 27 pikuls were received, and by the end of the month 73.96 pikuls had been issued. The greater part of the old rice was therefore used up in the month of February. The balance in hand at the end of the year 1904 was 104.06 pikuls of rice. With the exception of the month of February, when the amount of rice in store at the end of the month was only 12.40 pikuls, the balance of rice at the end of each month varied between about 30 and 90 pikuls throughout the year, but the amount was slightly greater during the last two months, when provision was being made for the north-east monsoon season. There was never a great surplus of rice in stock in 1904.

The Sumatran clerk in charge of the store told me that he always, so far as possible, endeavoured to interchange the bags, and this would have been feasible provided the supply of fresh rice was moderate in amount.

It was impossible to attempt to trace the local issues of the bags originally imported from Singapore, because the larger bags containing 1½ pikuls of rice were made up into smaller ones at the river store in order to facilitate their transport through the jungle to the mine; the small bags had no distinguishing marks, but through the courtesy of the General Manager of the Company I am able to show the exact amount of fresh rice that was stored during the year 1905.

The accuracy of the data given in the attached tables C and E can, I know, be relied upon, they have been prepared for me by the Chief Accountant of the Company. The figures, although complicated, are worthy of close attention.

In connection with table C, it is very important to remember that there can be no doubt that the tendency was to pile the bags of fresh rice on top of the

TABLE C.

SHOWING THE VARIATION IN QUANTITY OF FRESH RICE IN USE IN 1905.

Months	Amount of fresh rice stored during the first half of the month	Total amount of rice issued during the first half of the month	Amount of fresh rice stored during the second half of the month	Total amount of rice issued during the second half of the month
	Pikuls	Pikuls	Pikuls	Pikuls
January	16.93½	93.00	92.09	23.45
February	79.86	46.95	86.04	18.35
March ..	16.01	57.30	54.23	24.07
April ..	120.36	40.67	23.96½	76.20
May ..	6.82	82.58	–	40.82
June ..	81.79	84.93	87.83	27.12
July ..	136.95	75.44	100.74	27.30
August ..	111.60½	64.90	25.27½	30.32
September	86.06½	95.45	163.81½	20.70
October ..	84.76½	67.11	39.24	51.00
November	24.30	62.97	54.13½	24.50
ecember	23.88	41.70	—	25.10
Tota ..	789.34	813.00	727.36	388.93

older ones, and that until the rice began to be transferred from the river store many of the oldest bags were necessarily at the bottom of the stacks.

An examination of the above table shows that a very large quantity of fresh rice was stored throughout the year but the store was very short of fresh rice in the first half of January. The 16.93½ pikuls was delivered in two consignments, one of which (5.96½ pikuls) was received as late as the 7th of the month and the other (10.97 pikuls) not until the 9th of January. It follows therefore that 76.06½ pikuls of the old rice left from 1904 were used, and that 27.99½ pikuls of it remained in the store.

Very little fresh rice was received in May (only 6.82 on the 4th of the month), but the maximum 249.88 pikuls was received in September, as well as large amounts (165.90 pikuls) in February, and 237.69 in July, but only 78.43½ in November, the greater part of which came in on the 20th of that month.

A more critical examination of table C. shows that 96.63½ pikuls of rice were in stock at the end of January, and it will be remembered that of this amount 27.99½ pikuls remained from the old stock of 1904; by deduction it will be found that, disregarding this amount of 27.99½ pikuls for the present, the remaining 68.64 pikuls may have remained untouched until the first half of June, when 3.14 pikuls of this old rice must have been issued. At the end of May, exclusive of the 68.64 pikuls, there would have been only 28½ catties of fresh rice in hand. In the first week of June the greater part of the fresh rice (48.86 pikuls) was not received until the 13th day of the month and by far the greater quantity of rice was issued in the first half of this month as compared to the second half, and again, as regards the supply of the second half, 47.35 pikuls were received as early as the 18th of June. The labour force, it will be remembered, was greatly increased in May by a number of unacclimatised coolies.

It is not possible to supply an accurate statement of the days on which the rice was actually received by the Chinese contractors and other natives, through reason of the carelessness with which they presented their orders for rice at the store, but it may safely be presumed that the 68.64 pikuls with the old stock (27.99½ pikuls), was in use about this time and that the oldest of it had greatly deteriorated. This is corroborated by the Sumatran clerk, who tells me that he went on leave in February and found on his return in May that his substitute had neglected to endeavour to interchange the bags.

At the end of June, 126.55½ pikuls were in stock, including probably much of the 27.99½ pikuls left over from 1904, and on referring again to the bills of lading of the boat service, I found that the greater part (97.70 pikuls), of the fresh rice for the first half of July did not arrive until the 8th day of this month, while the greater part of that received in the second half (71.07 pikuls), came in as early as the 17th of July.

The Mining Accountant at the Sokor camp has kindly given me a note of his weekly balances of the rice in stock at the river store from May, 1905, until December; they were lowest on June 17th (90.68 pikuls), on June 9th (90.98 pikuls), on May 27th (94.61½ pikuls), on May 30th (126.96 pikuls), on June 24th (125.31 pikuls), and on July 1st, when there were 140.61 pikuls.

There can be no doubt, I think, in concluding that either stale or greatly deteriorated rice was in use at the end of December, 1904, during the first half of January, 1905, in May, at the beginning and end of June, at the beginning of July and probably at the end of July; it was found in use in December, 1905, after the rice had been transferred from the river store to the new store-house.

A brief summary of the clinical history of the disease shows that beri-beri occurred markedly in the beginning of January, 1905, in May, in June, very markedly in the beginning of July, and in the beginning of August, and as the rice was transferred in September by means of a limited number of bullock carts, in the process of removal it may, I think, be reasonably supposed that the oldest bags of rice then came into circulation, but this may have been delayed owing to the very large supply of fresh rice which was received in September, on account of the coming of the north-east monsoon season.

TABLE D.

SHOWING THE PROPORTION OF CASES AND DEATHS AMONG THE CHINESE IN 1905.

Months	Hailams under Contract		Khehs under Contract		Other Chinese		Treated in Hospital		Treated as Out-Patients	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
January ..	—	—	2	2	—	—	1	1	1	1
February ..	—	—	—	—	—	—	—	—	—	—
March	—	—	—	—	2	—	—	—	2	—
April	1	—	—	—	—	—	—	—	1	—
May	4	—	2	1	3	—	5	1	4	—
June	11	—	6	—	—	—	10	—	7	—
July	18	2	9	3	1	1	8	5	20	1
August ..	2	—	6	1	2	—	—	—	10	1
September ..	1	—	2	—	1	—	—	—	4	—
October ..	—	—	5	—	—	—	—	—	5	—
November ..	5	1	4	1	—	—	8	1	1	1
December ..	6	1	1	—	—	—	6	1	1	—
Total ..	48	4	37	8	9	1	38	9	56	4

In September and October the advance of the disease was arrested, but only to again progress in November and December.

The labourers in the Sokor district comprise chiefly Chinese, and for surface work a few Javanese and some Kelantan Malays. The Chinese are divided into two classes, the Hailams, who are immigrants from Hainam, and the Khehs, who come from a district north of Canton. Both classes form the mining coolies and each work in separate gangs under a contractor or contractors of their own class. Besides Chinese miners there are a few fitters and other Chinese who are not working under contract. The proportion of cases and deaths from beri-beri among the Chinese is shown below in table D.

It will be seen that the Hailams suffered most in July—18 cases with 2 deaths, also the Khehs in July—9 cases with 3 deaths, and that the only death which occurred among the other Chinese was in July. On turning to the hospital registers it was found that out of the 18 cases reported during the first half of July, no less than 13 occurred during the first week, and that all the deaths, as shown in table B happened, with the exception of one, to be in the first half of the month. All the cases mentioned in this paper were of the male sex; there were only three Chinese and very few Malay women in the camp.

Reverting to the supply of rice from the store it may be seen that the Hailams and the Khehs, as well as the other natives, obtained very large supplies of rice during the months of May, June and July, but comparatively little in February. The amount purchased by them and other natives is shown in table E.

BERI-BERI AS IT AFFECTS MALAYS.

It is now of telling interest to refer to the outbreak of beri-beri among the Malays and Javanese in the Sokor district. Malays, speaking generally, have no tendency to beri-beri, and they do not, as a rule, eat imported rice, but prefer to eat that which they plant and grow in their own country.

This rice is very seldom stored by them in their houses, unless in the form of paddy or rice in the husk; we have seen that this is very liable to go mouldy if stored. The natural custom of the Malays is to pound small quantities of their paddy into rice for cooking, and use it fresh, from day to day, as may be required for their household use. This exertion is undertaken by the women folk, who do not, as a rule, follow their people to the mining camps. One of the Malay patients in the Sokor district told me that although the Rangoon rice was very convenient, he could not afford to buy it all the year round as it was so much more expensive than the Kelantan rice, and he remarked naïvely that it always smelt of the bag even after it had been well washed and cooked.

TABLE E.

SHOWING THE AMOUNT OF RICE PURCHASED BY CHINESE AND OTHERS IN 1905.

Months	Hailam Contractor	Kheh Contractor	Other Chinese	Javanese	Malays
	pikuls	pikuls	pikuls	pikuls	pikuls
January	44.49	15.00	5.50	7.40	15.39
February	35.00	16.00	2.90	4.60	9.40
March	37.00	27.00	4.00	3.00	8.87
April	46.00	26.00	3.65	6.00	5.47
May	47.00	40.50	6.90	4.00	5.80
June	37.12	41.00	7.10	7.00	6.02
July	38.00	39.50	2.70	—	3.20
August	23.00	43.00	3.90	—	5.50
September	23.00	38.00	3.95	5.00	8.85
October	26.00	38.00	2.30	3.00	22.85
November	21.00	28.00	1.70	—	17.36
December	16.00	24.00	1.50	4.50	9.00
Total	393.61	376.00	46.10	44.50	117.71

The Malays in the Sokor district have always been in the habit of buying most of their rice at a village called Kusial, some fifteen miles distant, but, during the north-east monsoon season, owing to the wild weather and to the greater difficulty of jungle transport, they always buy Rangoon rice from the company's store in comparatively large amounts, as may be seen in Table E. It is significant that these Kelantan coolies, among whom beri-beri is unusual, should have escaped in June and July but should have succumbed in December, when they were eating the bad rice.

The weather in January, 1905, was remarkably mild for the north-east monsoon period, the total rainfall for this month only being 5·22 inches, and, under these circumstances, Malays could have obtained Kelantan rice from the village of Kusial. Malays in the Sokor district are too independent by nature to associate intimately with the Chinese, but will fraternise and eat rice with the Javanese. It will be noticed that the latter also laid in a comparatively large supply in January, February, and December, and probably for the same reason, but their mode of buying it from the store was quite different. The Malays invariably buy rice from the store in small quantities of about 40 to 80 catties at a time. The Javanese, who cannot so well afford the time to go to and from the store so often, always take their supply in bulk; for instance, in January they took the whole of their rice (7.40 pikuls) on one day, and in June their 7 pikuls in two portions on the 3rd and 15th of the month. In March, when I examined their diets, there was a good supply of fresh rice, namely, at the end of February. 169.24 pikuls (deducting again the 27.99½ pikuls), rather less at the end of March (158.11 pikuls), and a good supply at the end of April, namely, 185.56½ pikuls. It is curious that there were no cases of beri-beri among all the nationalities in February; only two in March among the Chinese, and one in April, months in which there was a good supply of fresh rice in use, and it may be of importance to recollect that rice, although mouldy or infested with worms, may be dried and winnowed in such a way that there is no apparent difference to the naked eye between it and rice which is known to be good.

Experimental Tests.

The only experiments which I was in a position to make were of a simple nature. Equal quantities (two ounces) of fresh Rangoon rice, mouldy rice and rice infested with worms were well washed, thoroughly cooked and set aside in the open air for forty-eight hours. At the end of that time a greyish mould appeared first on the mouldy sample and this was quickly followed by a light brick-red mould, which in point of time next formed on the sample taken from the bag infested with worms, but only appeared slightly on the sample of fresh rice at the end of the third day. Fresh Siamese and fresh local Kelantan rice were treated in the same way and the pink mould did not appear on either until the third day, and then first in point of abundance on the Kelantan rice. From the preceding experiments it would appear that mould on rice is not destroyed by boiling, as it formed sooner on the bad samples of rice than on the good samples.

It seems not unlikely that Chinese cooking pans, unless thoroughly cleaned daily, might become contaminated in this way, as well as tubs of water in which rice bowls and spoons are washed on the conclusion of a meal, by reason of rice falling into the tub and decomposing therein.

To remark, in conclusion, on the occurrence of beri-beri in the Sokor district, a small place in the jungle of a new country, where the means of communication are not good and where it is necessary to store a large quantity of imported rice, no management, however carefully thought out, could, I think, prevent a loss through deterioration. It is the usual experience in all mining camps in this part of the world, where climatic conditions are very unfavourable for the storing of this kind of food supply. I think it would be unfair also to brand Rangoon rice in particular as being specially unwholesome; most, if not all, of the other varieties of rice for sale in the East would, I think, sooner or later deteriorate in the same way under the same conditions. A solution of the difficulty in fertile places where rice in the husk can be obtained cheaply, might be to mill the local rice on the spot in such quantities as may be required from time to time, but other cereals, especially those which are supplied in bags, may also become mouldy or otherwise deteriorated. Besides these, also in local use, are sago and tapioca, which are exported to Europe from Singapore, as well as "dal," a small green pea which is imported, and three or four varieties of beans which are used locally, especially by the Chinese, who also favour two kinds of dried mushrooms.

I am indebted to Mr. W. Graeme Anderson, of the mining department of the Company, as well as to the General Manager and the Accountants for the help which they have given me in preparing these notes.

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THE PURU OF THE MALAY PENINSULA.

A DISEASE known by the Malay name of puru has never been described in detail from the Malay Native States before, and although it is very common among Malays, nearly all our information concerning it has hitherto come from the group of islands which forms the Malay Archipelago.

This wholly unmerited neglect by residents on the mainland in the description of puru has probably been partly due to the tardy exploration of this part of Further India, which was only commenced lately [1], partly to the natural reticence of the natives and the suspicion with which the Malay peasantry regarded the prying eye of Western medical science, but chiefly to want of independent medical observers with time and opportunity for special investigation.

Until quite recently the prevalence of puru in British Malaya seems to have even escaped the attention of the Federated Malay States Government, but this, again, is probably owing to the fact that the disease does not interfere much with labour, which is mainly carried on by Chinese, and, speaking generally, because it does not permanently injure the health of the Malay to any extent. The natural tendency of the disease is towards spontaneous cure. Death from puru is unusual; it is seldom fatal, unless during very early childhood or in advanced old age.

A period of seven years' service in the Government of the Federated Malay States, spent in the States of Pahang, Selangor, and Perak, has given me experience of puru, and a further residence of over two years in Kelantan, a Malay State hitherto unexplored by students of tropical medicine, and one in which this disease is most prevalent, has afforded me an unusual opportunity of observing it under purely native conditions. My contention is that the puru of the Malay Peninsula is identical with the West Indian and African yaws and the Fijian coko, and that it has no real relationship with syphilis.

THE HISTORY OF PURU.

The earliest references which can be taken as bearing upon puru are by Bontius in 1718, who seems to have recognised it in the Molucca Islands as the amboina pocks [2], and by Marsden, who mentioned a native disease called nambi in his "History of Sumatra" (1811) [3].

Many years later, Charlouis, who described framboesia from Java as polypapilloma tropicum [4], gave one of the local native names as nambie. But up till now (1886) even Hirsch had been led from want of records to assume that the mainland of Further India had been little, if at all, visited by framboesia or yaws [5]. Ten years later a definite outbreak was reported from Assam [6], and yaws has quite recently been described as being very common in Siam [7].

In 1893, Dr. Brown described puru from Penang as lupus contagiosus malayorum [8], and in an annotation on this important paper, Dr. T. Colcott Fox drew attention to the similarity of puru to yaws, but finally concluded that puru was the same as Oriental sore, and in 1897 the name was given as a synonym of that disease in Allbutt's "System of Medicine" [9]. It has since been shown that the appearance of some true Oriental or Delhi sores is by no means so characteristic as one would expect it to be from descriptions given in books [10].

Dr. Barker, of the Sarawak Civil Service, was the first to identify puru with yaws from Kuching in 1898 [11], and Dr. Connolly, of the Federated Malay States Civil Service, wrote a valuable memorandum in the same year, on the occurrence of yaws in Kinta, a district in the Federated Malay States [12]. Puru is given as a synonym of yaws in Scheube's "Diseases of Warm Countries" [19] (1903), and Mr. George Pernet (1904) has mentioned the puru of the Malay States under the heading of yaws [13], as well as Dr. C. W. Daniels, the Director, Institute for Medical Research, Federated Malay States, who has included it among the commoner diseases of Malays [14]; but with these important exceptions there are few, if any, direct references to the prevalence of the disease in the Malay Peninsula.

THE ETIOLOGY OF PURU.

The true infective agent of the disease has not yet been recognised, and in a review of the etiology of puru, little or no support can be relied upon from any in-patient hospital statistics. Cases either under the name of puru or of yaws are seldom included in the returns of the Federated Malay States hospitals. The reason is that although the Malay native attends readily as an out-patient at any convenient and charitable dispensary, or possibly clamours for medicine on the visit of a European to his village, yet, notwithstanding the many opportunities for further improvement offered by European hospital treatment, the peasant fails to this day to be attracted by the benefit of treatment in a hospital ward, and generally applies for admission in a spirit of tolerant curiosity and in a desultory fashion, which is merely the effect of a momentary enthusiasm or the result of a personal attachment.

Under these circumstances it is impossible to collect hospital statistics which are of any great value. There is no medical literature. The only knowledge is that of the individual. The Malay medicine man (bomor) and the witch doctor (pawang) is for the most part but a native magician or a veteran wiseacre. They say naively that puru (literally a sore), like small-pox, comes from the smoke of hell fire. I have obtained, however, a good deal of general information from these native physicians.

Age.—Puru is one of the most common diseases of Malay children, but it is rare among infants ; and it is, I think, seldom seen as early as the eighth month of life.

It is common to find puru in almost any Malay village (kampong) among little children who—although probably still at the breast—are able to walk alone and are exposed to contagion. The disease is not however confined to children, and may occur at any age, except at birth. Out of fifty individual cases noted in the out-patient registers of the Duff Development Company's hospital at Kuala Lebir in the interior of Kelantan (from July 1903, to July 1905), twenty-four were children whose ages ranged from four to twelve years. The others were all adults who applied for relief mostly during the first year of the establishment of the hospital (1903), suffering from the later manifestations of puru of the foot.

Sex.—Puru appears to attack either sex with equal frequency, but in adults lesions of the foot are more common among males.

There is a variety called puru kochi (literally, Cochin China sore), which is said by Malays to attack the genital organs only, and to be more common among the female sex, but not necessarily confined to women. Dr. C. W. Daniels has suggested to me the possibility of puru kochi being akin to sclerotising granuloma of the pudenda. It is rare, and has not yet come under my personal observation.

Race.—The permanent native population suffers out of all proportion to the many inhabitants of the Native States of the Malay Peninsula. It is no exaggeration to say that at least 90 per cent. of the Malays in Kelantan are attacked by puru. Europeans appear to be exempt, but I have seen it among Chinese, Javanese, Siamese, and more rarely in Sikh and Dyak settlers. In the Federated Malay States it appears to me to be uncommon among Tamil immigrant children. I have seen it among the wild aboriginal inhabitants (Sakai-Semang) of Kelantan. It is common among them, and in the Kuala Lebir district is known in their dialect by the name of "choh."

Heredity. — In this disease heredity has apparently no influence. Children are never born with puru, even if one or both of their parents suffer from the disease at the same time. Puru is never seen during the forty days of the Malay puerperal state. There is no evidence, in fact, of congenital puru among Malays, who hold that the disease is always acquired. Abortions as the result of puru are almost unknown, unless during a very severe attack. Intermarriage and consanguinity do not seem to have any influence. Among hereditary antecedents there are no diseases from which Malays commonly suffer which seem to have any relation to the etiology. Tuberculosis is, I think, on the whole, as infrequent as leprosy among the country people. Lupus appears to be unusual in the Federated Malay States.

Physical Geography.— The Malay Peninsula lies between the Straits of Malacca on the west and the China Sea on the east. It is made up of a number of Native States, which are divided into eastern and western by a range of mountains which runs like a backbone nearly through its entire length. The height of the various peaks of the range varies from 3,000 to over 7,000 feet above sea-level.

The most important of these states are under British protection. They are the States of Perak, Selangor, Pahang, and Negri Sembilan, which were confederated in 1897, and have since been known as the Federated Malay States. They are situated in the centre of the Malay Peninsula, and are bounded on the north and north-east by Province Wellesley and the Malay States of Kedah, Patani, Kelantan, and Trengganu; on the south by Malacca and the State of Johore; and on the east and west by the China Sea and the Straits of Malacca respectively.

The population of the Federated Malay States numbers approximately 665,000 persons.

Kelantan is the most important of the other Malay States. It approaches Siam, being between lat. 5° 40′, and 6° 20′, north. It is bounded on the north by the Malay States of Legeh and Patani—dependencies of Siam adjoining Singgora, the southernmost point of the kingdom of Siam.

Climate.—The Malay climate is hot, moist, and very equable, making the Peninsula a hotbed for fostering parasitic diseases of the skin, especially tinea imbricata, which is indigenous among many others. The average mean temperature in the shade may be said to be—maximum from 85·0° F. to 88·0° F., and minimum from 70·0° F. to 72·0° F. The highest maximum may be taken at 96·0° F., and the lowest at 68·0° F. The rainfall is large; over 100 inches per annum is the rule in most Malay states. Any division between wet and dry seasons for the year is very indefinite.

Geographical Extension.—As regards the Malay Peninsula, puru is probably universal, although it may be more common in some places than in others. It occurs in all the states of the Federation, especially in Pahang, and is very prevalent in Kedah and Kelantan. It has been observed as far north as Legeh and Patani. In Trengganu puru is said to be even more abhorred than small-pox, on account of its persistent and chronic nature.

Hygiene.—The personal hygiene of the Malays is good. Country people bathe at least twice a day, but there is often much to be desired in the cleanliness of their attire. Children at the age at which puru is common wear little or no clothing.

Social position has probably no influence at all as a predisposing cause of puru among Malays. In Kelantan it is as common in the dwellings which form the native palaces as among the cluster of huts which make up the smallest hamlets. His Highness the Rajah of Kelantan, for example, has suffered from puru as a child, and the princes frequently contract puru in childhood.

The hygienic conditions of Malay life are similar however, both in the high-born and in the low-born native as regards house accommodation. The sanitary condition of nearly all their houses is bad, and, although they are raised from the ground, they are ill-drained, ill-lighted, ill-ventilated and ill-cleaned. The daily household slops (mostly dirty liquid refuse from cooking) are thrown through loose bamboo floorings and allowed to soak into the ground beneath, so as to form a permanent slush under the kitchens. On the other hand, in the rural districts, where for the most part puru is very prevalent, it is very often common for natives to dwell upon bamboo rafts, which are made in the form of house-boats. The mass of the Malays, in fact, live either on rafts or in comparatively small huts built along the banks of the rivers. The Malay States are well watered by innumerable rivers and streams, and it is fortunately seldom necessary, therefore, to store water in this part of the East.

The only instance of the bad effect of stored water in the Federated Malay States is, I believe, an epidemic of zinc poisoning which occurred in Pahang in 1900 among a half company of Sikh soldiers, which might have been attributed to the climatic effect on the corrugated iron roof from which a supply of rain-water was derived [18].

Preceding Illness.—At first sight puru apparently possesses an analogy to syphilis, but it is never thought by Malays that there is any affinity between these two diseases. There are many specific characters by which to distinguish them. Neither is a protection from the other, nor do they vary in inverse ratio. It is only a previous attack of puru that protects the individual from a recurrence of puru.

It is fitting to mention here that—making due allowance for many errors in the definitions of Malay nosology—many of the manifestations of venereal disease, as it occurs among dark races in warm climates, are well known to Malays.

Gonorrhœa is generally known in Malay as sakit kenching (lit. sakit, sick, and kenching, urine), or as karang.

Venereal buboes are referred to in many States as mangga, which literally means a mango. Curiously enough, the Chinese also call them suai or mangoes. Syphilis is known in Kelantan as seduwan or seduwan sundal (seduwan, a bad disorder; sundal, a bare-faced harlot), or in other places as sakit prempuan (prempuan, a woman). Three stages of seduwan sundal are recognised: (1) The original manifestation in man or woman on the genital organs; this is followed by (2) seduwan bunga (bunga, lit. a flower or pattern on anything), which attacks the gums and face, and is supposed by Malays to be due to infection (uwap, lit. vapour or steam); and (3) seduwan angin (angin, lit. wind), which especially affects the joints and bones.

The term stong or restong is commonly applied to destructive ulceration of the nose, such as occurs in tertiary syphilis. These diseases are all of common occurrence among Malays as elsewhere.

Other Observations and some Native Ideas.—The contagion of puru is well known. Malays say that children who play about together catch it from one another, but though two or more children in the same family may contract puru at the same time it does not necessarily run through the whole family. A

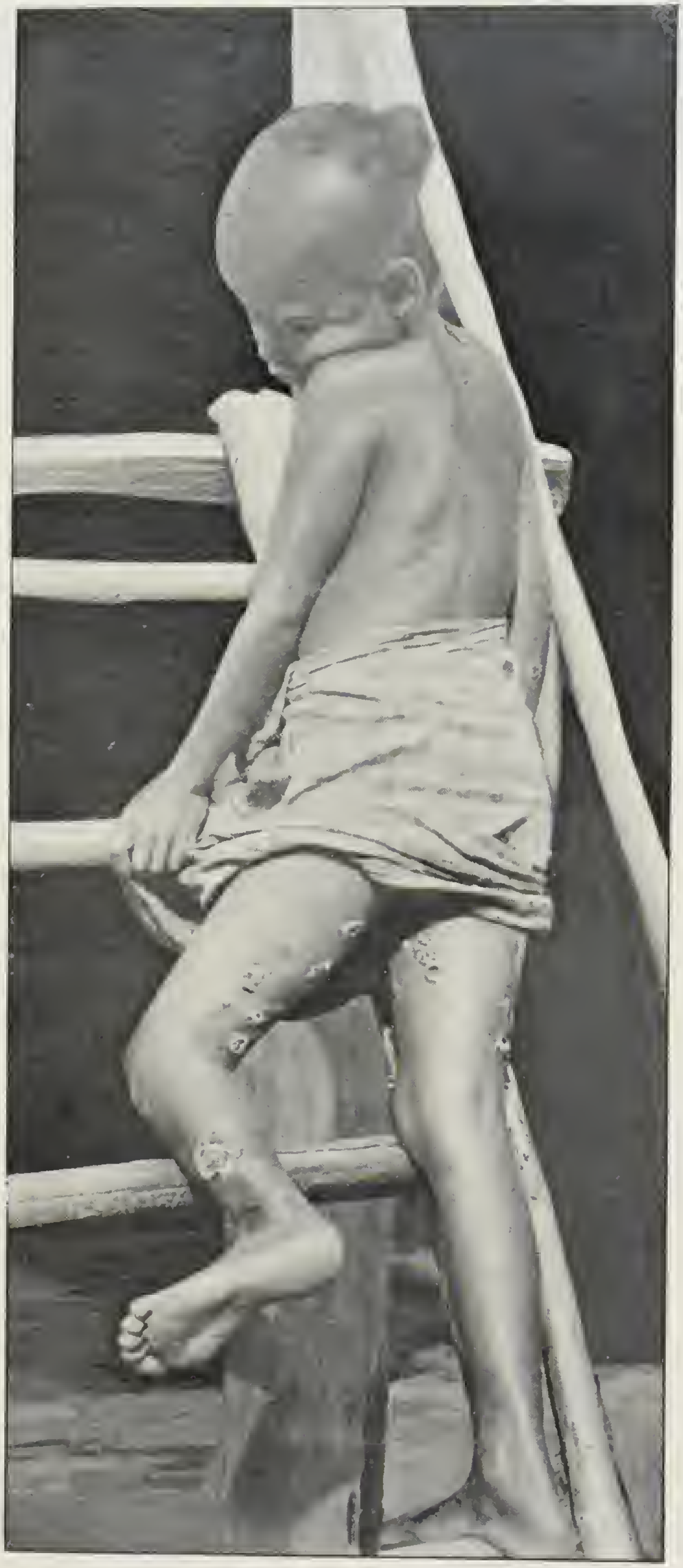

FIG. 1. —Mehpih—Case 1—showing the puru ibu.

second attack is said never to occur in the same person. Many hold that a kind of immunity is established in later life by the occurrence of the eruption in a rotation of three crops before the age of three years.

Isolation is never thought of, but natives avoid contact with the discharges of puru, and do not care to eat with people who may be afflicted with the general eruption. It is thought to be unwise to bathe immediately below any one suffering from puru of any kind, and many Malays are careful to bathe up stream, or away from people who are engaged in washing their sores or those of their sick children at the time.

Deliberate inoculation is never practised among them. The attack frequently follows on some slight scratch or abrasion, but it is said that the sores of the Malay kudis (lit. scurf), a kind of generic name given to ulcers as well as to scabies, or kudis gatal (gatal, to itch), and other sores of like appearance, are liable, on occasion, to take on the characters of puru sores. Leech-bites, although very common in jungle districts, do not receive much attention in this connection, but there is a belief among some Malays that the sores caused by contact with the fresh "getah," or live sap of a common fruit tree called in Malay pokoh machang (the horse mango, *Magnifera fœtida*), is a ready vehicle for inoculation by puru should there happen to be cases in the neighbourhood.

Sores on the lips and about the mouths of children may often be caused by eating the acrid fruit of this wild mango. The juice of the durian blossom (*Durio zibethinus*, L. Malvaceæ) is also blamed in the same way. These trees, however, are seldom avoided in consequence. Puru is well known to attack people both before and after they have suffered from small-pox. Small-pox is common in the uncivilised states, and educated Malays in the Federated Malay States often attribute the decline of puru (in Selangor, for example), as well as the apparent immunity of Europeans and their children, to the fact that, as a rule, all European residents and their children are more or less well vaccinated in childhood. Malay children, however, who have been well vaccinated readily contract puru, and it is more practical to account for the apparent immunity of Europeans and their children by explaining that they are not very much exposed to the contagion of puru.

It would be exceptional for European children to have many native playmates in places where puru was common. As a matter of fact, most Europeans, by reason of the refining influence of civilisation, are reluctant to come into personal contact with the loathsome-looking sores of puru. The advance of civilisation among the Malays in this respect, together with the influence of modern sanitation, should tend towards the check of the disease. In the civilised states of Selangor and Perak puru used to be far more common in the towns than it is at present.

Malays do not appear to associate the idea of flies or insects being possible agents in spreading puru, and although their expression, "bagi lalat chari puru" (as the fly seeks the sore), is used in conversation, it is applied more in the sense of the saying, "Where the carcase is there will the eagles be gathered together." The common house-fly (*Musca domestica*) is not very prevalent.

Malays live rather poorly, the peasants mostly on boiled rice and dry salted fish, but diet does not appear to have much influence in the causation of puru. Native settlers, especially Chinese, favour a far more liberal diet.

In Kelantan, the practice of eating a home-made condiment of badly preserved sea-fish is very common. It is made by pounding two kinds of small fish (in Malay, bilis and kikih), salting them, and adding a little water. The young fish are chosen, and the raw preparation is kept for forty days, and when in a state of decomposition is ready to be eaten with rice. It is called "budu" and "peda" in Pahang. Dr. Hanitsch, the Curator of Raffles Museum, Singapore, has kindly identified these fishes for me. The larger of the two, ikan kikih, is *Equla edentula*, which is distributed in the Red Sea, Seas of India, Malay Archipelago and beyond. The smaller, ikan bilis (lit., ikan, a fish), is *Engraulis indicus*. It is very common about Singapore, belonging to the family *Clupeidæ*, which comprises herrings and sardines.

Some Malays in Kelantan attribute the prevalence of puru in this state to the comparatively large amount of budu which is consumed by Kelantan Malays. The custom, however, seems to be peculiar to the eastern and northern states and to be in no way responsible for the origin of puru.

In Kelantan a very widespread and fatal disease occurs among fowls. It is characterised by an eruption about the beak and eyes, often leading to blindness. I have not, however, been able to trace any clinical resemblance between it and puru as it occurs in human beings.

The Clinical Characters of Puru.

Puru is universally recognised by Malays as being a specific disease. They have carefully observed the constant groupings of its symptoms and have given differential terms to its various manifestations. The most prominent of the well-marked clinical characters is the appearance of the eruption of the puru sores as it occurs in Malay children.

The disease attacks otherwise healthy and robust children, and observers with any experience of puru cannot fail at sight to recognise the eruption of puru sores in Malay children owing to its constant and uniform appearance. In the later stages of the disease it is not so easy to speak so definitely nor to recognise the sequence of the symptoms.

There is a stage of incubation, efflorescence, decline and sequel, but Malay children are seldom seen during the early stages of puru. In adults, again, the eruption of sores is more likely to be seen among foreign native settlers. Malays have mostly experienced it in childhood. The incubation period is therefore difficult to determine. It is given off-hand by most Malays as being twenty days. The attack is generally preceded by an ill-defined constitutional disturbance which causes some slight fever, as well as rheumatic-like pains in the bones, back and limbs. These symptoms are occasionally delayed or suppressed through chills, and it is said that the prodromal pain in the bones is then very pronounced and the backache equal in severity to the pains of small-pox. The joints in such cases are tender and swollen quite early in the disease.

The initial puru breaks out all over the body as a miliary papular eruption (" ketut " in Malay), and often in successive crops. It is attended with great itching, so much so as to give occasion for the Malay proverb, " Orang yang puru gatal tubohnya neschaya menggaru juga kerja-nya " (A man whose body is itching with puru will always be engaged in scratching it). I doubt, however, if the itching is sufficient to keep Malays from sleeping. Children often complain of feeling chilly at this early stage of the disease; they are feverish, peevish, and disinclined to bathe. The efflorescence of puru, known in Malay as the " bunga " (a blossom), develops gradually from the primary papular eruption. The " point d'appui " is most often at some simple scratch or small sore from which springs what is known in Malay as the " puru ibu," or mother sore. This is formed by a combination of several papules and is generally the largest sore as well as the best developed and the most persistent. It is most often found below the waist, on the foot, leg, or thigh, but it may occur on the wrist or hand. This particular clump of papules may assume a horseshoe shape, or may develop into a large sore, as in fig. 1.

Malays always fancy the " puru ibu " to be the initial sore, and they often think it is a misfortune if it should disappear early in the disease. It is often the last sore to heal. Malays also think that it is impossible to arrest the development of the "puru ibu" and so prevent puru from spreading over the body and subsequently affecting the joints.

The "bunga puru," or efflorescence of the disease, originates from the papular eruption and seems to spring up like seed planted, as it were, beneath the skin and to grow up into a crop of tubercles which gradually bursts through the skin and expands into a number of discrete lesions, which ultimately become the typical clinical features of puru. Many of the original papules, on the other hand, involute and subside. There seems to be no reason (such as irritation from scratching, &c.) for some of them to develop into puru sores while others, and perhaps the majority of them, disappear. As they develop they are moist by reason of a glairy, thin, scanty, but rather sticky discharge, and on cutaneous surfaces they gradually dry up and generally form sores which are covered with a hard, tenacious, dirty, yellowish crust. Puru sores at this stage are those which are most commonly met with. Pus, unless formed by irritation, is not as a rule found under the crusts, and in four or five instances I have found the discharge to be either alkaline or neutral to litmus paper.

The sores are scattered over the face, neck, trunk, and extremities. They are more or less disproportionate and vary very much—from a grain of maize to a betel nut, for example—in point of size. They are often flattened out, but always seemed to be indolent and insensitive. By soaking of the crust of a small and rather old typical sore the reddish and roughly granular contour of the swelling may be exposed. It is not unlike a raspberry in appearance. Multiple and typical examples may be seen in the armpits and on the penis.

Irregular-shaped sores are very common at the angles of the mouth, at and about the nostrils, on the buttocks, and about the anus and genitals. When the eruption is well out the general health is practically unaffected, particularly when the sores have dried and scabbed over. They seldom ulcerate to any extent. I have never seen them transformed into "sloughs."

The disease does not attack the viscera, so far as can be judged without the aid of *post-mortem* examinations; the nervous system and the larynx appear to be exempt. There is certainly no specific affection of the eye in puru; deep lesions of the tongue do not occur, but the sores are said to attack the mucous membrane of the mouth. I think this, however, must be rare. The symptom is known as "guwan" or "serawan" in children. It has possibly been confounded with "thrush." The occurrence of an attack of puru for the first time in old age is said to be grave.

Puru sores heal very slowly of their own accord, and when they are at last beginning to decline they shrink and gradually disappear, leaving either dark purplish transient stains or a few dark superficial scars.

The disease is of long standing; it frequently lasts for one or two years, but often for a much longer period. Sometimes the initial papular eruption becomes scurfy ("puru sekam"), and in other cases it may develop in places into a serpiginous eruption ("puru kretas"). When the eruption comes out slowly constitutional symptoms ("senggai puru") are complained of, such as malaise, simple periostitis of the long bones, and painful swelling of the wrist, fingers, and other joints. These symptoms are not at all uncommon in adults. During the decline of the disease, reminders in the shape of tiresome sores may crop up long after the original sores have ceased to recur. This is, I think, especially noticeable with sores of the foot, which are very common in adults who have suffered from puru in childhood. They generally occur on the sole and are very painful until they have burst through the epidermis. The pain is said to be much aggravated in the bare-footed native by contact with the dung of the buffalo and chicken. In Kelantan they are especially common during the durian (the thorny fruit) season in July and August, and for that reason, I believe, are called "puru durian." These foot sores are also seen in children.

A kind of xerodermia, or keratosis of the skin, as shown on the hands in fig. 2, also occurs on the foot, and is ascribed to puru. In appearance it is like dirty parchment paper, but the dry skin frequently cracks and causes painful fissures. This must not be confounded with the common affection of the feet, known locally as "burok chelapah" (lit., burok, rotten; chelapah, soiling by the tread). It is due to walking barefoot on gravel or sand.

Although puru as a disease is liable to be very persistent and recrudescent, Malays never acknowledge any lesions of deep nature, such as nodes, chronic dactylitis, chronic arthritis, and deep ulcers, as being sequels of puru. Lesions of the kind shown in fig. 24 and Plates XXXIX. and XCI. of the New Sydenham Society's Atlas [15] are very common among Malays. I do not think, however, that in the case of the Malay Peninsula one is justified in attempting to fit these facts into a clinical description of puru. They appear to me to be manifestations of syphilis.

THE VARIETIES AND COMPLICATIONS OF PURU.

Malays distinguish the varieties of many of their diseases by a number of clinical names. For example, small-pox, which is common among them, has been given—under the name of "penyakit ketumbohan"—no less than eleven different descriptive names, according to the appearance of the pustules. Again, the average intelligent Malay will recognise at least seven different varieties of ringworm. Puru is divided in the same way into several varieties, the chief of which are: "Puru siput" or "puru kechar" ("siput" and "kechar," a shell); "puru mata kerbau" or "puru kerbau" ("mata," an eye; "kerbau," a buffalo); "puru sekam" or "puru dedak" (chaff or bran); "puru kretas" (paper); "puru kochi" (Cochin China sore); "puru tapak anjing" ("tapak," a footprint; "anjing," a dog); "puru pitis" (a small coin); also "puru parang" ("parang," a chopper) and "puru kenam." Puru of the foot is generally known as "bubol," but it is frequently referred to in Kelantan as "puru duriyan." "Bubol" has been somewhat fancifully divided into "bubol sarang" ("sarang," a nest); "bubol malai" (aigrette); "bubol susoh ayam" ("susoh," a spur; "ayam," a chicken), and "bubol bubok" (bubok," a wood maggot).

Of these Malay varieties, "puru siput" is characterised by its rupial-shaped sores, and is perhaps the most common. It is considered to be the most benign form. It is not painful, and the sores heal easily. An example of "puru siput" is shown in fig. 1.

"Puru mata kerbau" is common. The sores are very large, but heal readily. Kelantan Malays call this the real puru. It may be combined with "puru pitis."

"Puru sekan" is especially irritable with regard to itching.

"Puru kretas" is distinguished from other forms of puru by the general superficial character of the eruption. It is only skin deep, gyratory, very painful, and difficult to cure. It is the worst kind known and may cause death. It may be combined with "puru mata kerbau."

"Puru tapak anjing" is another bad kind of puru. It is very painful, and leaves large, though insignificant, scars, either similar to a dog's footprint or very irregular in shape. The sores are supposed to occur on the body, placed in the way a dog leaves marks after walking on the sands—here some and there some, and none in the middle.

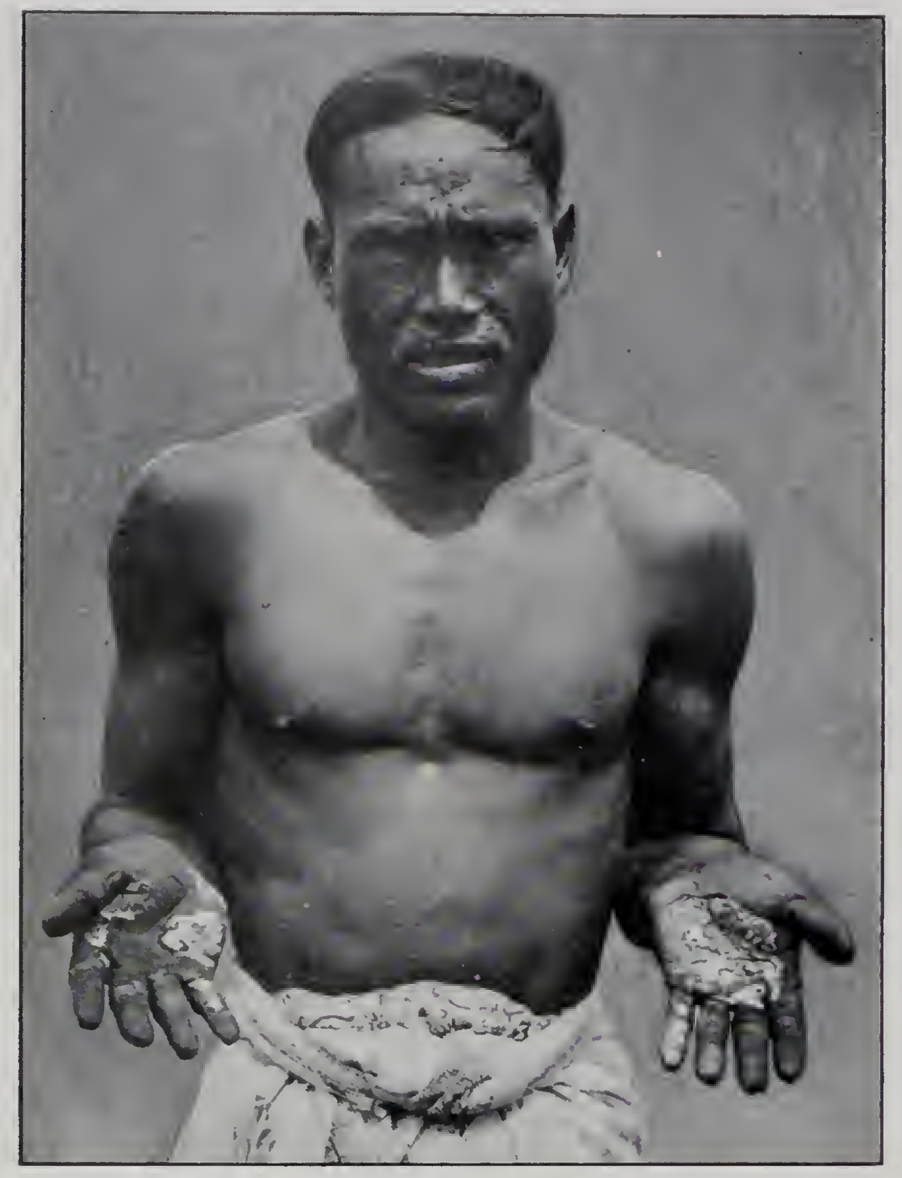

FIG. 2.—Che Musa. Showing effect of late puru on the palms. The skin is otherwise normal. There is no affection of the throat or tongue.

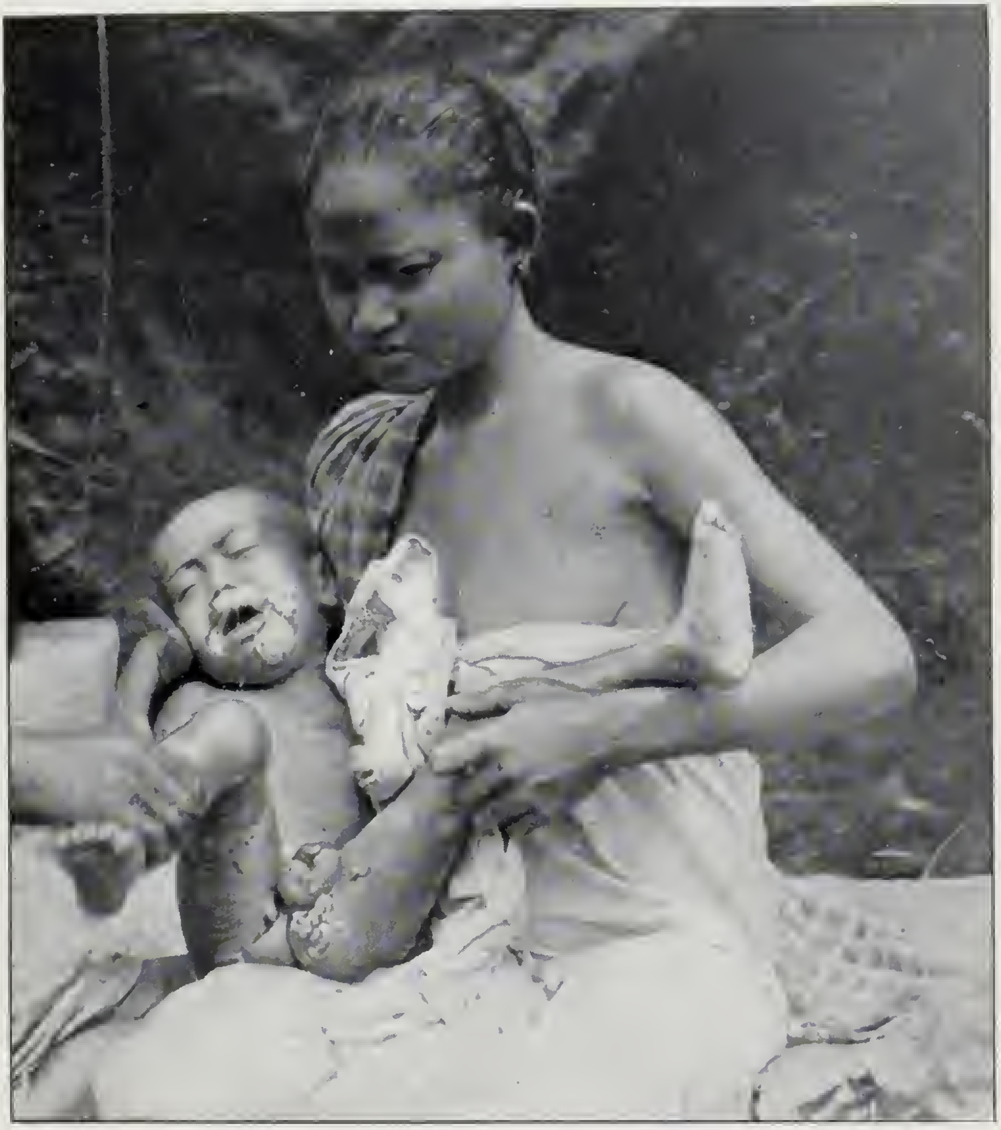

FIG. 3.—Puru mata kerbau. From a photograph taken by J. R. Dubois, Esq., at the village of Kuala Takal in the interior of Kelantan.

Puru kochi has been mentioned under etiology. It is referred to in an old Malay dictionary as the venereal disease [16]. "Puru kochi" is said to be chronic. It is not considered fatal, although no native medicine will cure it. It is also called "puru glang besi" (glang, lit. a bracelet or anklet; besi, iron).

Puru kenam: in Kelantan "kenam" is said to occur when small children get lumps ("kenam") all over their body. It appears as circular red spots, and it is interesting to note that it is sometimes known as "puru Burma."

Puru parang is said to complicate other sores, and to be recognised by its deep ulceration. It occurs on the foot, and is said to attack old people.

There are various other unimportant so-called varieties.

Intercurrent diseases are generally the cause of death. A first attack of puru in old age is always serious. Young children may succumb, although rarely, to asthenia. Cellular abscesses may form. Scars are indefinite, but it is exceptional to find villagers who have not had puru early in life, and who cannot point in later life to some dark scar left by the disease. The old scar of "puru ibu" is as well remembered by Malays as are vaccination marks by Europeans. It resembles in appearance the scar of scalds or burns of the third or perhaps fourth degree, except that it is dark in colour. Scars are sometimes definitely depressed, and when on the face may cause contractions of the mouth known in Malay as "sipit mulut" ("sipit," puckered; "mulut," mouth). A slight disfigurement is very common, and is known as "birat" in Malay. Permanent deformity of the limbs and ankylosis of joints may also be the result of puru.

THE DIAGNOSIS OF PURU.

Doubtless if the nature of puru were not well understood many cases of it might be classified as syphilis, because at first sight there seem to be many points of resemblance. Both rank among affections the study of which is mainly clinical; both are constitutional diseases with a period of incubation, efflorescence and decline; each is conveyed by direct inoculation, and followed in a slowly running course by the occurrence of remainders, and perhaps sequels with a tendency towards spontaneous cure. Puru is so well known to Malays, however, that they are unlikely to confound it with any other disease. They know that syphilis can be passed on from father or mother to their children, but hold that puru is always acquired.

The diagnosis is chiefly based on the combination of the characteristic eruption with itching, on the peculiar insensibility of the tubercles, on the general uniformity of their aspect, and on the limitation of the constitutional disturbance. There is only one disease—called "supia" in Kelantanese Malay, and "sang kai she toy" in Chinese—which might be mistaken for puru. This is confined to children, and occurs about the head, neck, and scalp. It appears to be similar to impetigo contagiosa, and, except for the clinical appearance of the honey-coloured scabs, to have but little real resemblance to puru. Puru does not attack the fœtus. Even when it occurs in infants before the age of eight months, it hardly ever causes an increasing cachexia with terminal diarrhœa. The peculiar hue, physiognomy and "snuffles" of syphilitic infants are wanting. The puru ibu, again, differs essentially from the primary sore of syphilis, in being generally made up of a collection of multiple tubercles which is not prone to ulcerate, but likely to last throughout the disease. This is in marked contrast to the single sloughing sore of primary syphilis as it is generally seen in Malaya. I have never seen inflammatory sore throat ("sakit kailan" or "kekail" in Malay) in puru. Polymorphism and symmetry never strike the every-day observer in any of the skin lesions of any of the varieties of puru as they may do in syphilis. Itching is the rule and alopecia the exception. Bone lesions are, I think, rare. It is difficult, indeed, to know to which stage of syphilis the Malay puru may be compared to in detail. Although, as in Case 3, a child can infect its mother with puru if unprotected, people who have had puru can contract syphilis, and others (as in Case 4) who have had syphilis can contract puru.

European practitioners must, I think, be familiar with examples of syphilis acquired by Englishmen returning home from the Malay peninsula. Puru, however, is probably unknown to them. In the one case the disease, if acquired from a Malay, is probably due to some chance infection. In the other, a European, unless converted to Mohammedanism, could never, I think, live in sufficiently close contact with Malays so as to acquire the disease for a certainty.

CLINICAL CASES OF PURU.

CASE 1. *Puru in a Malay Child.*—Mehpih, a girl, aged about 9, Kelantan villager, born at Duson Nyor in the interior of Kelantan.

Father and mother dead; no brothers or sisters. Patient was first seen at Dusun Nyor (lit. the garden of coco-nuts) on June 13th, 1905; she is said to have been ill with puru mata kerbau for more than six months. The sores are almost confined to the legs and the back and inner side of the thighs. For the most part they are soft, yellowish-white, and moist. The secretion from all the moist sores (about five or six in number) was found to be alkaline. Some of them were inclined to bleed on being scraped. The child is anæmic, but otherwise the general health appears to be unimpaired. She has lost the sight of the right eye owing to an accident. There is no apparent enlargement of the spleen on palpation, although malaria is very common among Kelantan children.

Puru is very prevalent in this village. Out of about forty inhabitants, fourteen or fifteen children are ill with puru mata kerbau. Examination of blood smears taken from some of them, as well as from the patient (in the forenoon), proved to be negative.

Several smear preparations made from the sores on June 13th, and again on the 21st, were stained by the Romanowsky and other methods, but nothing distinctive was found by me under the microscope beyond a number of round granular cells which stained readily with basic dyes. There were no large cells and micrococcus-like bodies which have recently been described by Surgeon-Captain James [10], Dr. Homer Wright [17], and others, as occurring in tropical ulcer or Delhi sore. This child was treated by the local application of zinc and mercurial ointments mixed together, and when last seen on July 24th, 1905, the sores, with the exception of the puru ibu, had nearly all healed.

CASE 2. *Puru in a Chinese.*—Hap Hoy, a mining coolie, native place Hong Kong, married, no children, was admitted into the Duff Development Company's Native Hospital at Kuala Lebir, Kelantan, on April 1st, 1905.

Family History.—Father died of some chest complaint about 50; mother alive and well; no brothers; one sister in good health. Has never seen any cases like his own among friends or relatives in China.

Previous History.—Emigrated from China eleven years ago, and, with the exception of malarial fever, has always been in good health.

Stayed in Singapore for five years, was in Pahang for two years, and at Tomoh for four years, when he got ill and went from there to Kelantan. He never had syphilis nor gonorrhœa; has not had sexual connection for more than twenty months; has never had a sore on the penis before. Is accustomed to take a little samshu (Chinese spirit), also chandu (opium prepared for the pipe).

States that he knows two fellow-countrymen at

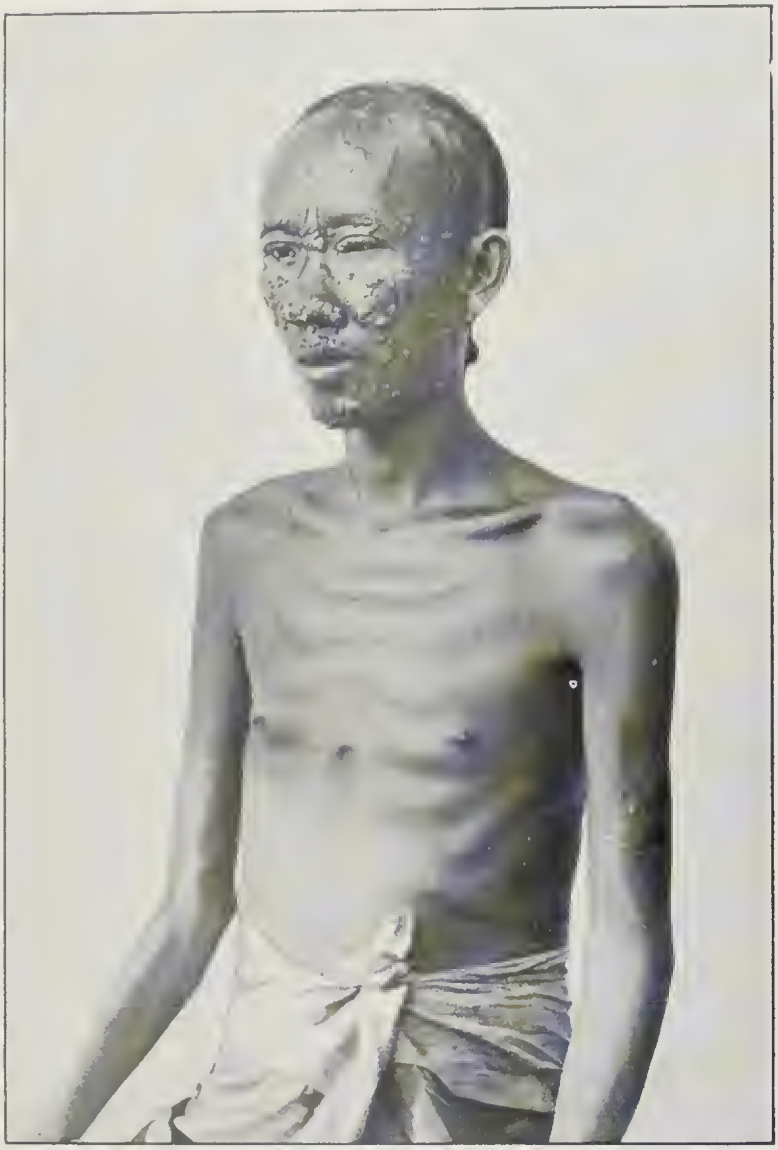

FIG. 4.—To illustrate Case 2, showing the sores of puru.

Tomoh who have the same disease all over their bodies, and that it is very common among the Malay children of that state. Did not live in the same house with the other Chinamen. Has eaten "budu" (a Malay condiment made of decomposing fish) when there was no better sauce to be procured.

Present Illness.—About six months ago was cutting firewood in the jungle and scratched the foot at the right ankle. A week previous had felt unwell and feverish. The ankle was painful; the scratch itched a little and presently became sore. Four or five sores then developed, and in about forty days they coalesced and reached their present horseshoe shape and size, which is (April 5th, 1905) 6·35 cm. by from 2·54 cm. to 0·63 cm. Later on the foot was painful on walking any distance. A month afterwards again felt feverish, and the eruption came out on the forehead and scalp. A sore came next on the left side of the prepuce; it itched and he scratched it. In two months' time sores had formed on the right side of the prepuce. Up till now he had continued at work, but then the sores attacked the nose and eyelids. The nasal sores spread out gradually at the nostrils until they reached their present size, namely, on April 5th, 1905, nearly 10·16 cm. by 1·9 cm. Had then to stop work as a mining coolie on account of pain in the bones and in the joints, and decided to come to Kuala Lebir. The sores are now (April 5th, 1905) drying up. No fresh ones have appeared for about a month. The last to appear were on the back.

On Examination.—The eruption is known in Malay as puru, and it has the characteristics of the disease as shown in fig. 4, which was taken on April 3rd and 5th, 1905. There is no apparent enlargement of liver or spleen. There is sympathetic femoral bubo in the right groin, but it is unlikely to suppurate. No other glandular enlargements. The foot sore is suppurating under a thick scab. The discharge is acid to litmus paper, but that from the sores on the penis and forehead is alkaline. Two tubercles were removed from the back under cocaine, as well as one from the prepuce. Prior to examination, these nodules were placed for twenty-four hours in 30 per cent. alcohol (in filtered water), then for the same time in 70 and 90 per cent., and finally in absolute alcohol. The result of the microscopical examination is given under the heading of pathology.

The sores were dressed with Scott's dressing and a mixture of iodide of potash, 5 grains, three times a day, administered by the mouth. The sore on the ankle was dressed with chlorinated soda lotion.

By the end of the month a great improvement in the general health had taken place. The pains in the limbs and joints had entirely ceased. On May 25th another tubercle was removed from the hairy part of the chin, and carbolic acid, pure, was applied to the cut surface, because it seemed as if puru sores were forming at the site of the former incisions. They all healed naturally, however, in the end. In June, the iodide was increased in dose to 10 grains and 5 minims of liq. arsenicalis were added to the mixture. The patient improved daily, but only up to a certain point. He was next given mercury internally, the liq. hydrarg. perchloridi, in half-drachm doses for two weeks, but as he appeared to be still losing ground under this treatment it was discontinued, especially as some of the old eruption (which had apparently been cured) began to recur. Various local applications were then tried, including the application of tincture of iodine, ichthyol vasogen, thymol ointment, and white precipitate ointment, but without much success. He was finally treated with zinc and mercury ointment alone, and appeared to derive most benefit from it.

CASE 3. *Puru in a Malay Adult.*—Mehlimah, female, Kelantan Malay, aged 47, married, twelve children, was first seen on April 14th, 1905, at Lubok Kawah in Kelantan. The patient states she has been ill for about a year, and has been inoculated with "puru mata kerbau" by her youngest child, aged about 2, who, with his sister, aged about 6, is now recovering from the disease. She says that all her children have had puru, but up till the present time she herself had not had it. Her husband suffered from it in boyhood; a married sister, however, has not yet had puru.

The patient looks ill. The eruption is sparse. She is crippled and complains of great pain in the hands and feet, and in the wrist, elbow and knee-joints. The joints are swollen and very tender. She is kept awake at night by the pain, and has been confined to the house for many months. She is still suckling the youngest child. On the left breast there is a flattened puru tubercle covered with a dark dry scab. There are some similar lesions on the abdomen about the level of the umbilicus, where the child would naturally be held in nursing. The shin bones are much swollen and tender, as well as the phalangeal joints. The scar of the "puru ibu" in this case was on the right shin. The ibu sore had healed before the decline of the other sores, which, with the exception of those on the body, had mostly come out on the neck. This patient was given a mixture containing iodide of potash, 10 grains, night and morning, and an ointment composed of ung. hydrarg. 1 drachm, and zinc ointment to 1 ounce. She was greatly benefited by it, and by the end of April was free from pain and able to walk alone. At the end of May the sores had all healed.

Case 4. *Puru in a Sikh.*—Pak Singh, a Sikh, of no occupation, aged 39, was admitted to the General Hospital at Kuala Lipis, Pahang, on February 2nd, 1900. He had been ill for a few days, and was supposed to be recovering from chicken-pox. He was removed to an isolation ward, where the eruption developed into one which was generally recognised as puru. The patient gave a definite history of primary syphilis, and was not discharged until April, and then only partly cured, although treated with mercury as well as iodide of potash during the whole of March.

This case appears to be analogous with the clinical case of the sea Dyak given by Dr. Barker in his report from Sarawak.

THE PATHOLOGY OF PURU.

There is little in the pathology of puru which has not already been described under the heading of frambœsia or yaws.

The disease being seldom fatal, it is impossible to record the result of any *post-mortem* appearances, more especially because *post-mortem* examinations are almost prohibitive among Malays owing to religious custom and strong racial prejudice.

Microscopical Appearances of Puru Tubercles.—Some of the growths which were removed from the chin and back of Case 2 were sent to the Institute for Medical Research, Federated Malay States, and were, by the courtesy of the Government, examined by Dr. C. W. Daniels, the Director of the Institute. His report is as follows :—

" *Tubercle from Back.*—Nodule mainly composed of a round-celled growth in the tissue, covered almost completely by altered epithelium. The growth is not one mass, but is formed of a series of nodules of irregular size and shape loosely connected by fibrous tissue.

" On tracing the epithelial layer from the normal skin at the edge of the nodule we find that over the tumour it is more irregular in thickness and that the papillary processes are larger and very irregular. All the layers are altered. There is no properly formed keratinous layer and none of the intermediate cells in process of keratinisation. The epithelial cells over the tumour are swollen, stain irregularly, and are often vacuolated.

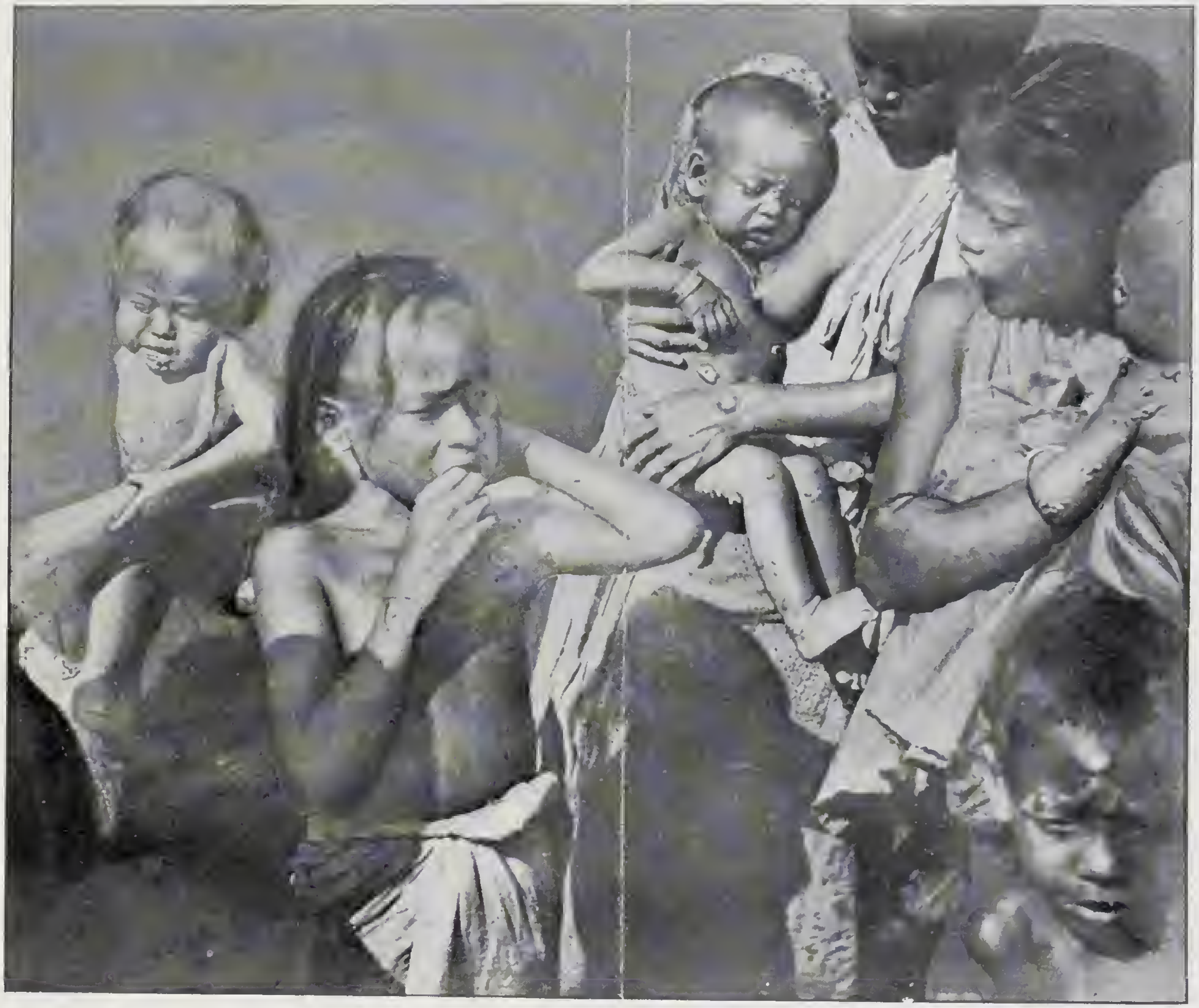

FIG. 5.—A group of Malays at Dusun Nyor, in Kelantan, showing the prevalence of puru among the children of the village.

"They are not arranged in definite layers and the palisade arrangement of the deepest layer is poorly marked.

"The growth itself is composed of round cells with scanty protoplasm. The cells and nuclei stain well with basic stains. Mitosis is common and there are no areas of necrosis, caseation, or suppuration. The cells vary a little in size and occasionally much larger cells with single nuclei are seen. In the depth of the growth there is some thickening of the fibrous stroma. The growth is supplied with blood-vessels.

"*Tubercle from the Chin.*—This specimen is from a more hairy part and hair follicles extend through the growth. It differs from the other specimen in that the growth is less abundant and the fibrous stroma more so and that the hair follicles extend through the depth.

"No micro-organisms were found in the deeper parts of the sections of the growths."

This description agrees with the most recently published account of the microscopical appearances of frambœsia or yaws tubercles [20]. It is important to note that no congener of the *Spirochæte pallida* was found. The original sections are sent with this paper.

THE TREATMENT OF PURU.

Malays have given much attention to the treatment of puru, both with drugs derived from their own flora and by the use of a few imported medicines, but their efforts, which are mainly empirical, have not proved very successful in every-day practice.

In the hope that a definite therapeutic preparation might be made out of one or other of their local products, I recently sent some notes to the Therapeutical Society of London, on some of the methods employed by Kelantan Malays in the treatment of puru. Botanical specimens of most of the plants referred to were sent to England with the paper. They were all obtained in Kelantan, most of them from a hamlet—Kampong Kutan—near Kota Bharu, the capital. These original notes, with additions, are now embodied in the present essay.

Native Therapeutics.—In the earliest stage of the disease the only native form of treatment employed for the relief of the prodromal fever and muscular pain is the superstitious Malay practice of "menjampi," or charming by incantations.

The medicine for the first stage of puru is said by native Malay doctors to be the leaf of the merbor (?), plant and those of the jenera (?) rotan jerenang (*Dæmonorops draco* [L. Palmæe], the dragon's blood). These leaves are chewed up and spat on to the swelling or ibu.

It is generally held by Malays however, that active treatment is of no avail until the full development of one or more puru sores has been attained. The sore which is often watched with the object of timing the commencement of treatment is the "puru ibu," or mother sore. When this so-called parent sore is developed, their most valued remedy is the external application of a latex or kind of gum which is called "geta-agu" in Kelantan, or "getah jintan" in Pahang. This is obtained from a climbing jungle creeper known in Kelantan as "akar agu" ("akar," a root, the generic name for scandent or creeping plants) and is very like *Hunteria roxburghiana*, though uncommon. It is prized by Malays, especially a red variety, and, like many other of their medicinal plants, is protected and cultivated. The latex is obtained by cutting the live stem and mixing it with water to allow for its inspissation, and it may be bought in this form in the native market at Kota Bharu in Kelantan. The remedy is smeared day by day on the sores of the general eruption. So far as my experience in Kelantan goes, "getah agu" causes the sores of puru to shrink and is of value as a local application.

Another latex which is valued is collected from a jungle creeper called "akar gam" (*Willoughbeia firma*); in this case the remedy is obtained by incising the fresh fruit or the stem. It is generally known under the name of "buah gam" or "gehan" ("buah," a fruit), and is commonly applied to the sores of puru in the same way as "getah agu." In some cases in which the sores are chronic and do not respond to treatment the fruit is gathered, dried, then roasted and powdered, being finally made into a paste with a little water for local application. In other cases of chronic and recurring sores, the ashes obtained by burning the stem of "rotan sega badak" (*Calamus ornatus*) are used. "Rotan," in Malay, is a generic name for rattans of the genera *Calamus* and *Dæmonorops*.

Another local Malay remedy is well known under the name of "terosi," sulphate of copper. In the general treatment of puru, "terosi" is reduced to fine powder, and then mixed with palm oil or with a latex called "getah pulai," which is obtained by cutting the stem of the young pulai tree (*Alstonia macrophylla*). External applications of this kind containing "terosi" cause a great deal of pain, prevent sleep, and on this account are not often used, rarely if ever being employed in the early stages of puru. With the object of preventing pain these applications are sometimes prepared by first burning the "terosi" in a slow fire until it is blackened, then pulverising and mixing it into a paste with either cocoanut oil or the juice of the common lime fruit called "limau nipis" (*Citrus acida*).

The most important of all the Malay drugs for sale in the Kota Bharu market is "tuba tikus," which, like terosi, is imported by way of Singapore. "Tuba tikus" is pure arsenious acid or white arsenic, generally seen in rather odd forms which seem to be due to its having been collected from the flues of some dyeing works. The name appears to be used idiomatically by Malays; "tuba," is the name of a jungle plant, the root of which possesses certain stupefying properties; "tikus" signifies a rat. It is used externally in the treatment of puru, either by itself in the form of a powder, or as an addition to various kinds of roughly made "pastes" which are prepared from certain native plants. These vegetable "pastes" are freshly made as occasion demands; in one instance by grinding down with a little water the root of a wild red vine, called in Malay "puchok merah" ("merah," red), a plant which is identical with *Leea rubra*, and in another case by treating in the same way the root of a low shrub called "chekor manis" (*Sauropus albicans*); "manis" is the Malay for sweet, or light in reference to some colours.

"Tuba tikus" is used as a poison by criminals, and is not administered internally as a medicine by Malays. It is the "berangan puteh" of Java.

The sulphurets orpiment and realgar are also used in puru, but all the external applications containing arsenic, being caustic, are much disliked on on account of the pain which they occasion. "Tuba tikus," like "terosi," may be burnt and applied in the same way, either with or without oil.

"Mali puchok merah" is given by the mouth for puru, as well as being used externally, and among other internal remedies are "melor hutan," a wild jessamine (*Jasminum bifarium; Oleaceæ*) and the black variety of kemantu. This latter is a tree of Indian origin (*Clausena excavata*). It is called "pokoh kemantu hitam," or the black kemantu tree, "pokoh" meaning a tree, and "hitam" black. There are other varieties of this tree which are not used in medicine. "Akar jela batu" is also administered internally for puru; but there is no fixed dose. In each case the roots of these plants are ground down on a "batu asah" (a stone on which medicines are pounded or ground down) and then infused in cold water. Occasionally a mixed infusion is used in puru of kemantu hitam and "tuko takal" (*Baccaurea* *wallichii*; *Euphorbiaceæ*), a jungle tree which is fairly common.

The only treatment of the disease by Malays when it affects the joints is by the constant application of "ayer tawar," or plain water over which certain charms have been said.

In Kelantan sovereign remedies are common. A typical native prescription is as follows: Take the knee-cap of a tiger, the bones of a duyong (the dugong), the bones of a goose, the bones and horns of a kambing gurun (a very rare wild goat, *Nemorrhædus bubalinus*), the horns of a rusa, a wild deer (*Cervus unicolor*), while still soft (lembong); add belirong bang (sulphate of arsenic), and chendana janggi (red sandal-wood), and mempus harimau (a kind of wood). Grind these ingredients down with some boiling rice water (ayer dideh), take a small amount of ashes from the hearth, mix, and administer the draught by the mouth.

Various applications are made for puru of the foot. The following method of treatment known as "tanak puru" ("tanak," to cook) is a favourite one with some Kelantan Malays. A small round hole about a foot in depth is made in the ground, and a slow fire is kindled at the bottom of it; half a cocoanut shell with a hole in it, or a suitable piece of bamboo, is then fitted over the red-hot embers. On the top of this improvised screen the affected foot is rested in such a way as to expose the sore to the heat of the smouldering fire. Kemantu leaves are often put on the fire as well as those of "kedondong," a tree belonging to the genus *Canarium*; in addition to the leaves the bark of the latter is sometimes burnt on the embers. Relief of pain is obtained after three or four lengthy exposures.

Lime, which is commonly used in betel chewing, is also a popular remedy for puru of the foot. It is mixed with oil or with the juice of "keladi puyoh," a common Malay ariod of the genus *Alocasia* (*Typhonium* *roxburghii*), and plastered on to the sores. Stones may be heated and applied as hot as can be borne. The actual cautery in the shape of red-hot iron nail is occasionally used, and even excision is attempted by means of "parangs" or rough iron choppers which are usually used by natives in felling brushwood.

It is of general interest to note that the drugs used in puru are not used by Malays in their treatment of syphilis. The chief Malay drug used for syphilis is "pokoh restong" (*Malaccensis*) which grows wild, but is often cultivated, and it is praised by natives as being a valuable medicinal product. The root is used, mostly in the form of a lotion, especially in cases of ulceration and destruction of the nose. This as well as "trong pipit puteh" (*Solanum*) is also given internally for syphilis, but they are not employed in the treatment of puru. "Puteh," in Malay, literally means white, and the word "trong" is used to designate the plants of the *Solanaceæ*.

Hospital Treatment.—At the present time puru is rarely, if ever, treated in the isolation wards of the Malay Peninsula. It is hardly necessary to dilate upon the importance of isolation in the case of a directly contagious disease of this nature. I think it may be assumed that some isolation of puru cases (although prophylactic treatment of this kind must always be difficult among Malays) may be eventually achieved in these hospitals.

Preparations applied locally of mercurial ointment will be found of great value in the treatment of the disease, especially in combination with zinc ointment. Sores which are healing during the decline of the disease are generally benefited by daily applications of tincture or liniment of iodine. Puru of the foot is often relieved by the application of pure carbolic acid or sulphate of copper. I have not found alkaline lotions of sodium bicarbonate to be of much benefit. Iodine of potash is generally of great value, especially during the stage of "senggai puru." It quickly relieves, as a rule, the rheumatic-like pains if given in doses from 5 to 10 grains (to adults) twice or thrice daily. Attention to general hygiene and cleanliness is nearly always indicated. The syrup of Iodide of Iron is often of great service in the treatment of puru during childhood.

Although my practical acquaintance with the disease is limited to the Malay Peninsula, I would conclude that puru is identical with frambœsia or yaws, and I would plead that this tropical disease should at least rank as a nosological entity in the medical returns of British Malaya.

I am indebted to Mr. H. N. Ridley, F.L.S., Director of the Botanic Gardens, Singapore, for his kindness in classifying very many of the drugs, and to Mr. P. Burgess, M.A., Government Analyst, Straits Settlements, for his examination of the mineral known as "tuba tikus," or ratsbane; also to Mr. R. W. Duff, Managing Director of the Duff Development Company, Limited, to Mr. H. W. Thomson, Assistant Adviser to His Highness the Rajah of Kelantan, and to Ungku Sayid Hussein, a member of the Kelantan nobility, for their cordial collaboration.

I must also thank Dr. C. W. Daniels, the Director of the Institute for Medical Research, Federated Malay States, for making the examination of the pathological tissues and for many kindly and valuable criticisms.

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PLAGUE IN FURTHER INDIA.

Further India has been affected by plague to a small extent in comparison to the Indian Empire. Some considerable interest therefore attaches to the comparatively unimportant local outbreaks which occur, from time to time, in the Malay Peninsula. It is generally very difficult to explain the reason for their limitation and to determine, with any degree of accuracy, the source of the infection. Kelantan, a small but populous and fairly healthy Native Malay State, situated in geographical position between 4° 45′ and 6° 25′ lat. N., and 101° 30′ and 102° 40′ long. E., has only been exploited by European enterprise during the last seven or eight years. The State seems hitherto to have escaped from plague. The Kelantan Malays in fact, so late as 1905, looked upon plague as a new disease and, for want of a better name, then referred to it as the "penyakit leher" or "neck sickness." Numerous deaths from this so-called "neck sickness" were reported by the natives of the interior to have occurred at some remote villages in the month of May, 1905. The illness appeared from the clinical descriptions given by the Malays at the time to have been bubonic plague. It was not thought necessary, however, by the Kelantan Government to take any special precautions to prevent its spread and the disease disappeared of its own accord in a few months' time.

Late in 1907, plague broke out among a gang of imported Javanese coolies who had been working throughout the year on a part of the Duff Development Concession, which is situated in the interior of Kelantan. It was at once recognised by the local Malays as the new disease, or "penyakit leher," of 1905.

In this instance, prompt preventive measures were taken by the Duff Development Company and no wide-spread epidemic occurred, but it is not easy to say whether the limitation was really due to the precautions taken, or to the climatic conditions of the Malay Peninsula, which seem to prevent the spread of plague in an indirect way, or to the keeping of cats—a cooperative measure which as Lieut.-Colonel Buchanan (1908) has lately pointed out—seems to have some indirect controlling influence over plague in India.

The plague in Kelantan occurred on a part of the Duff Concession, which is being opened up by the planting of a rubber estate, situated about one hundred and fifty feet above sea level and sixty miles inland, located on the left bank of the main river and some fifty miles from the capital of the State. Among many commercial possibilities in Kelantan the planting of rubber is attended with success because, speaking generally, the earth is fairly loose, and although poor in chemical composition, like the generality of soils elsewhere in Malaya, is well adapted by favourable physical and meteorological conditions to the successful growth of trees.

In 1907, the total rainfall for the interior was 120·54 inches, with 176 rainy days; the mean average maximum temperature in the shade for the year was 85·7° F., and the average mean minimum temperature 70·9° F., shade maximum temperature 90·5° F., and minimum 67·0° F. The climate is therefore naturally suitable for planting in being uniformly hot as well as constantly moist, a condition which appears to be unfavourable to the propagation of the fleas which are so commonly associated with man and domestic animals in the hotter, drier and more sandy parts of the tropics.

The flea (*Pulex irritans*) as a parasite of man and as distinct from the bug ("pijat," in Malay), is unknown to Malays in this part of Further India. There is no distinctive name for it, but the dog flea is well known as "kutu anjing" (lit. "dog louse"), probably because it is the most common species; the lighter coloured cat flea is not specially identified by Malays, neither is the smaller black goat flea commonly found on kids. A rat flea again is not specially recognised, although rats as well as mice are generally to be found in the bamboo huts of any Malay village community. A certain amount of paddy, or rice in the husk, is always stored either within or underneath the houses, which are almost invariably raised some feet from the ground.

The keeping of cats is a national Malay convention which is common to other Mohammedan people, but in Malaya the influence of folk-lore has an additional significance. The ancient superstitious faith of the Malays before their conversion to Mohammedanism seems to survive in the everyday treatment of their cats and to afford them some protection.

Among many curious ancient Malay beliefs concerning mammals, is one that an evil genius pertains to both the rat and the cat. Clothes, for instance, however costly, that have been nibbled by rats must not be worn again. A cat is always driven out of the house in the event of a death; it is most unlucky if perchance a cat should brush against a corpse, the dead may stir. It is even more unlucky to kill a cat outright, and consequently at least one or two ill-favoured cats are to be found in almost every Malay dwelling-place.

The fact that they kill rats is the reason which is invariably given for their tolerance.

In the Malay State of Kedah there is even a special exclamation "puspas," for driving away the cat from the primitive household dresser, but should it become too tiresome any Malay cat is banished from the village by common consent. As a last resource, it is tied, in

Kelantan, by the neck to a stake, fixed on an improvised raft, and floated down stream. The unfortunate village cat again is not unfrequently drenched with water in the hope, by this means, of averting a threatened period of drought. There happened to be no cats on the Company's rubber estate: a fact which is interesting as giving negative support to Lieut.-Colonel Buchanan's hypothesis.

In 1907, for the development of the plantation, about 140 Javanese, 120 indentured Chinese coolies or "sinkhehs," and a variable number of local Malays were employed in clearing, burning and draining the jungle.

The conditions of labour necessarily involved in the development of a new territory were rough and ready and the health of the imported coolies had in consequence not been good.

Early in November, three deaths occurred suddenly among the Javanese, followed by three others within twenty-four hours. Damp and comparatively cold wet weather, which is usual in the North East Monsoon period, had now set in, and these sudden deaths marked the commencement of a small outbreak of plague which eventually caused 13 deaths out of 31 cases, as shown in the accompanying table.

The epidemic began at the time of the Malay "hari raya," an annual native festival which follows the "bulan puasa," or regular Mohammedan fasting month. The occurrence was at a particularly wet season of the year when a migration of rats to the coolie lines, owing to a scarcity of food in the field, might have been thought of, but the early diagnosis of plague was more than usually difficult because the early symptoms happened to be masked by those of acquired alcoholism.

The type at first was pneumonic and very fatal, followed by an evident bubonic but very mild form of plague and finally resolving into pestis minor.

The Javanese on the estate held the national holiday on the 8th, 9th and 10th days of November, and many of them, not being very strict Mohammedans, indulged in some cheap brandy in order to celebrate their merry-making. Two boys, Kassim and Kasti, were admitted to hospital on the 10th of the month for pneumonia and pleurisy, but no special importance was attached to their cases; both however died of plague, one on the 13th and the other on the 14th of November. On the 11th, Sakimin, a male dancer, died suddenly at the estate, and his death was supposed by the Superintendent to be due to alcoholism with heart failure from over-exertion in dancing and exposure to the rain. Another male dancer, Mortostiko, died suddenly on the following day. At autopsy alcohol was found in the stomach and there was consolidation of both lungs, but no distinctive buboes being noticed, the real cause was again mistaken and the cause of death returned as pneumonia. On the evening of the same day a third dancer, Matjas, a tailor by trade, died suddenly at the plantation: the autopsy revealed recent pleurisy and dilatation of the heart with acute congestion of the lungs and kidneys. A number of enlarged, deep reddish, lymphatic glands were found in the retro-peritoneal fossae and the diagnosis of plague was made, but there were no characteristic buboes. There was an open wound on the left leg. Other deaths followed in quick succession, all with pulmonary symptoms; Kasti on the 14th, Wagio on the 15th with broncho-pneumonia and diarrhœa, Sutaruno on the 17th—the most typical and virulent example which had so far occurred—Nagadikon on the 20th with leading symptom of pleurisy, Tipostiko on the 21st with pneumonia, Kamso on the 22nd with pleurisy and pneumonia, and Matsariwi on the 23rd with pneumonia. Matsariwi was the last case of the kind, and although no alcohol had been taken, his primary symptoms much resembled those of drunkenness. The autopsy of this Javanese revealed the presence of a horse-shoe example of "solitary kidney" which was bound by adhesions to the spinal column. The bad effect of alcohol in plague, other than in medicinal doses, appears to have been only relative in this small epidemic. Out of seven dancers (Kasanpaiviro, Katimin, Mongin, Mortostiko, Matjas, Sakimin, and Samirah), four had regaled themselves with brandy, and of these only two died, one of them (Katimin), in whose sputa *B. pestis* was found, recovered and the other escaped infection. Of the remaining three, who all drank syrup and water, only Matjas the tailor died suddenly and the other two remained in good health. One of the two that escaped, Samirah, is a woman and it is remarkable that the epidemic, with the one exception of Parsem, a girl coolie and a prostitute, was confined to the male coolies. The children, about fifteen in number, all escaped except one ; they lived with the women at the further end of the coolie lines. One little boy, Kader, having no mother, lived with his father in the Javanese male quarters ; he fell ill but recovered in hospital from an attack of broncho-pneumonia complicated with large cervical buboes. It was not difficult to demonstrate the presence of *B. pestis* in the sputa of these cases, but no very profuse sanious expectoration was observed in any of them.

Although plague never occurs in equatorial regions in a bad epidemic form, the gravity of individual cases is maintained. This was exemplified in the case of Sutaruno, a strong man who was brought from the estate as suffering from mumps. *B. pestis* was found in the secretion of the parotid buboes, and hyperpyrexia very rapidly ran into delirium followed by coma and death within twenty-four hours of his admission to hospital. Shortly before his death large numbers of small, superficial, subcutaneous hæmorrhages occurred, depicting, in livid colours, the malignant nature of the case. Four days afterwards, Hamat bin Janka, an in-patient under treatment for rheumatism, who had volunteered to nurse this case, developed cervical buboes followed by inguinal buboes but ended in recovery. In the first week there were eight Javanese deaths out of fourteen cases; and of these fourteen cases all except five were characterised by pulmonary symptoms and nearly all were under the age of thirty. A typical example of the sudden collapse which may occur in plague was afforded by Kamso, a young Javanese who left the estate in a quarantine boat for admission to hospital, apparently in no very precarious condition. He died suddenly on landing through being allowed to walk up the river bank, which is rather steep. No evident bubonic swellings could be seen or felt after death, but dissection disclosed a mass of deep glands in the right femoral region; both lungs bound down by thick yellow adhesions; the pericardium very much thickened and containing an excess of fluid, the heart dilated; both lungs œdematous and hyperæmic with hæmorrhagic infarcts in the lower lobes, the liver enlarged and both kidneys congested.

The earliest cases of a simple bubonic nature were noticed among the Javanese between the 15th of November and the 8th of December; there were eight altogether and with the exception of one (Kromorjo), they all recovered; four had inguinal buboes, three femoral and one an axillary bubo.

The virulence of the epidemic appears to have been exhausted by the end of November, shortly after recommendations for the prevention of the spread of plague had been very strictly put into force. Up till now the Chinese "sinkhehs," who lived in separate quarters but quite close to the Javanese males, had all escaped; they as well as the Malays employed on the estate were all males, but the Malays dwelt at the further end of the lines near the female quarter about two hundred yards from the other coolies. There was consequently very little intercourse between the Malays and the male Javanese.

Pestis minor was diagnosed mostly among the Chinese "sinkhehs" who began to sicken with it in December, and of those coming within the incubation period (six to seven days) and isolated as "suspects," four developed buboes which could not be accounted for otherwise; these comprised two inguinal, one femoral and one axillary bubo. About the same time, some Chinese employed at the headquarters of the Company, nearly three miles from the estate, fell ill, and four other cases were found, three with femoral and one with cervical buboes, but none of these men suffered much inconvenience; all recovered, and several on admission might, by casual clinical examination, have been easily mistaken as suffering from malaria. Four of the total number were treated for double femoral buboes.

The actual channel through which the infection was imported to the estate was not determined. Popular suspicion rested upon some clothes brought in by Matjas the tailor, who went to Kota Bharu the capital, fifty miles away, to purchase goods for the coming "hari raya" festival. Kota Bharu was known to be free from plague by the Siamese medical officer and the resident English officers representing the Government of Kelantan, and he returned from there on October 25th, sixteen days before the first case. His purchases consisted of a few pounds of some pleasant tasting seeds (basil), some syrup, sugar and a variety of clothes among which were three pairs of elastic braces. The clothing was not however unpacked until the first week in November, it was then put up for sale at the estate, and Samirah, the dancer, bought and wore some of it with no ill-effects; Parsem wore some and was very ill, but the latter being a prostitute it is probable that she may have acquired infection in some other way. The braces, said to have been imported from Bombay *viâ* Singapore, were bought by two of the men who died suddenly and the odd pair was given to a little boy (Jonet), a nephew of the deceased tailor.

All the clothing was sold, along with the other purchases, at a small native shop kept on the estate, at that time, by the Javanese headman. The shop was in a very insanitary condition, more especially in regard to ventilation, but although rice and other native food stuffs, such as cakes, sweetmeats, biscuits and the like, were stored, it never appears to have been over-run with rats. No mice were seen. A possible hiding place for fleas existed in some bullock hides which were stored among the rafters of the house.

In 1905, most of the deaths occurred inland on the opposite bank of the river, but a few Malays died from "penyakit leher" in a village near the site afterwards chosen for the dwelling houses on the plantation. This suggests that the former epidemic may have subsided owing to the heat of the South West Monsoon period of 1905 and, the infection remaining latent in 1906, may have revived during the coolest part of the year 1907.

Presupposing that a number of rats existed in the field, the hypothesis is not so improbable as it may seem at first sight. The infection, for instance, may have remained latent in the form of chronic rat plague. In 1907, the last burning of felled timber and brushwood on the plantation took place in the forenoon, late in October. It would certainly have driven any field rats from their burrows and may have caused them to seek shelter in the coolie lines which happened to be near at hand. Fleas imported by traders from without and introduced among the clothing brought in to the estate by Matjas the tailor may then have been infected.

The Company's hospital being situated up stream, a system of inspection in conjunction with a quarantine boat service was at once established; the patients were isolated and a crusade commenced against the rats found in the houses on the estate. This was done by means of traps and by killing them with sticks by hand. It disclosed some features of interest, as there were apparently very few rats, either in the shop or in the adjacent Javanese male quarters. No attempt was made to destroy rats in the field. The wet weather was unfavourable for the practice of suffocating them in their tunnels by means of carbon bisulphide. This method, which is used for the extermination of rats in the rice fields of the Federated Malay States, was recently introduced by the Director of Agriculture and would, in other circumstances, be also of material benefit in checking the spread of plague. Out of a total of about fifty rats eventually killed on the estate, the majority came from the female quarters when the epidemic was practically over. They were nearly all young rats about the age of commencing sexual maturity and all of them were small black rats (*? Mus rattus*). A much larger brown rat, which is found in the native town of Kota Bharu was not seen on the estate. It was of interest to find that most of the few rats that were caught in December were young ones because it has been shown in Egypt that the maximum pregnancy of the rat, in that country, corresponded with the maximum of plague and the literature of plague abounds with examples of epidemics in which a scarcity or disappearance of rats has been noted. No naked eye appearances of disease were recognised in four adult rats that were dissected or in five others that were examined; *Loemopsylla cheopis*, the flea of the black rat, escaped recognition although a sharp look-out was kept for its capture. For the destruction of these insects all the coolie lines were disinfected bi-weekly with a solution of Jeyes' fluid, about 1 in 40 in strength.

The hides were disposed of; all clothing which in any way appeared likely to convey infection was burnt, the shop pulled down and a number of minor precautions of local importance insisted upon. Quarantine regulations were dispensed with one month after the diagnosis of the last case, but still a good deal of anxiety was felt for the Malays on the estate who suffered from an ill-defined form of fever in the middle of December. They disbanded, returning to their homes to be nursed by their women folk, as is their custom. Kelantan peasants are very conservative in their customs and in their belief of ancient superstitions, such, for example, as breathing or blowing over a cadaver in order to drive out a supposed evil familiar spirit; this and similar procedures, employed under exceptional circumstances, would render the scientific practice of plague prevention very difficult in Further India in the event of a serious epidemic of plague occurring among the Malay residents. Out of about forty Kelantan Malays, however, who might have been exposed to infection at the estate, happily only one death from "penyakit leher" was announced from the neighbouring villages and there has been no recurrence of the disease.

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The Journal of Hygiene, 1909, *page* 60.

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A Return showing the Number of Cases of Plague in Kelantan—1907.

No.	Name.	Sex.	Nationality.	Occupation.	Date of attack.	Result.	Clinical Remarks.
1	Kassim	M	Javanese	Estate Coolie	10. xi. 07	Died 13. xi. 07	Leading symptom, pneumonia.
2	Kasti	M	,,	,,	10. xi. 07	Died 14. xi. 07	Leading symptom, pleuro-pneumonia.
3	Sakimin	M	,,	,,	11. xi. 07	Died 11. xi. 07	Died suddenly, leading symptom, alcoholism.
4	Katimin	M	,,	Mandore	12. xi. 07	Recovered	Leading symptom, pneumonia; *B. pestis* in sputa.
5	Mortostiko	M	,,	Estate Coolie	12. xi. 07	Died 12. xi. 07	Leading symptom, alcoholism, p.m. exam.
6	Matjas	M	,,	Tailor	13. xi. 07	Died 14. xi. 07	Died suddenly at the Estate, p.m. exam.
7	Wagio	M	,,	Estate Coolie	14. xi. 07	Died 15. xi. 07	Leading symptom, broncho-pneumonia.
8	Kader	M	,,	Child	15. xi. 07	Recovered	Pneumonia and cervical buboes.
9	Wongsolaksomo	M	,,	Estate Coolie	15. xi. 07	,,	Indolent femoral buboes.
10	Sutaruno	M	,,	,,	16. xi. 07	Died 17. xi. 07	Scepticaemia, large cervical buboes, p.m. exam.
11	Matsariwi	M	,,	,,	17. xi. 07	Died 23. xi. 07	Pneumonia with deep glands, p.m. exam.
12	Kasanpaiviro	M	,,	,,	17. xi. 07	Recovered	Indolent inguinal buboes.
13	Madicom	M	,,	,,	17. xi. 07	Died 20. xi. 07	Acute pleurisy with deep glands. p.m. exam.

14	Kromorjo	M	,,	,,	17. XI. 07	Died 3. I. 08	Indolent inguinal buboes, asthenia.
15	Tipostiko	M	,,	,,	19. XI. 07	Died 21. XI. 07	Leading symptom, pneumonia.
16	Matajoh	M	,,	,,	19. XI. 07	Recovered	Bubo, right axilla, *B. pestis* found.
17	Mamat bin Janka	M	,,	,,	20. XI. 07	,,	Contracted in hospital from case No. 10; cervical and femoral buboes.
18	Kamso	M	,,	,,	22. XI. 07	Died 22. XI. 07	Died suddenly; p.m. exam., pleuro-pneumonia.
19	Parsem	F	,,	,,	22. XI. 07	Recovered	Indolent cervical and inguinal buboes.
20	Hamat Estart	M	,,	,,	23. XI. 07	,,	Indolent inguinal buboes.
21	Slamat	M	,,	,,	26. XI. 07	,,	Indolent inguinal buboes.
22	Kasanmuradi	M	,,	,,	27. XI. 07	,,	Indolent femoral buboes.
23	Talio	M	,,	,,	4. XII. 07	,,	Femoral buboes; *B. pestis* found.
24	Liang Ho	M	Chinese	Sinkheh	8. XII. 07	,,	Inguinal buboes; subsequently died of Beri beri.
25	Wong Kong	M	,,	Prisoner	8. XII. 07	,,	Indolent femoral buboes.
26	Lee Ah Choi	M	,,	Barber	10. XII. 07	,,	Indolent femoral buboes.
27	Tan Kit	M	,,	Sinkheh	15. XII. 07	,,	Bubo, left axilla; subsequently died of Beri beri.
28	Ang Niu Seng	M	,,	,,	15. XII. 07	,,	Indolent bubo, left groin; died of Beri beri.
29	Hai Tiam	M	,,	Station Coolie	15. XII. 07	,,	Bubo, left groin.
30	Chan Yow	M	,,	Sinkheh	17. XII. 07	,,	Indolent inguinal buboes.
31	Chin Heng	M	,,	Station Coolie	23. XII. 07	,,	Cervical buboes.

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J.D.G.

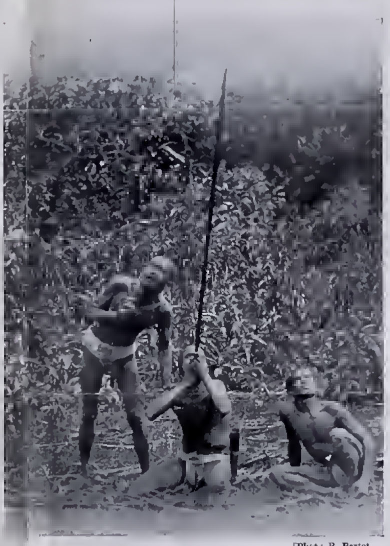
[Reprint from the "Field," the Country Gentleman's Newspaper.—Sept. 9, 1911.

THE JUNGLE FOLK OF KELANTAN.

FEW TALES have been told about the people who form the wild tribes of British Malaya. These timorous folk are outcasts, who wander restlessly about the mighty jungles of Malaya and speak a language of their own, quite distinct from the Malay language. By tradition they claim to be the men of the land, and are generally recognised as the aborigines who fled, during the twelfth century, before the advance of the Mohammedan Malays who invaded the Peninsula from Malacca. They are known collectively as Sakai, but without much propriety, because several distinct tribes exist, each still speaking a crude and different dialect. At the present day they are under the heel of their masters, the Malays, and are so shy from constantly herding together in the silent woods and mountains that they are seldom seen by the majority of European residents in the Far East. The general influence of the Malays in regard to these wild tribes has been in the direction of oppression, but trade and intermarriage has often brought about friendly relations.

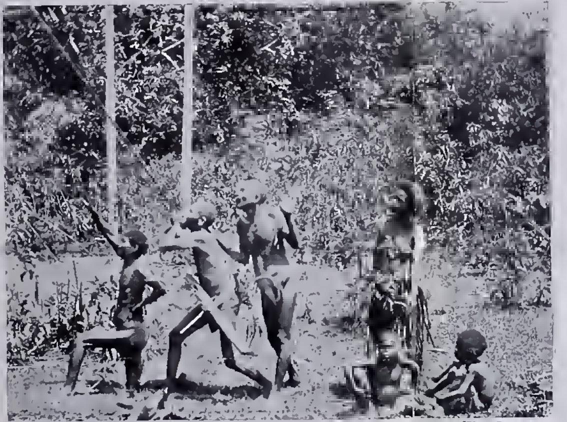
A little while ago a party of them camped near Serasa, in the State of Kelantan, a station on one of the up-country rivers of the territory which has recently been taken under British protection. Through the agency of a local Malay, who spoke their dialect, I succeeded in making arrangements for a visit to their camp, though it seemed doubtful if I should succeed in actually seeing them, because it was pointed out to me by the Malays that, having heard of the arrival of the white men in the State, and being conscious of their own inferiority, they would naturally be suspicious and fearful. Nevertheless, on the day appointed two aged representatives of the Sakai came in to greet us, and I started with them in a small dug-out canoe and paddled down the main stream. Both old creatures were partially clad in dirty sarongs, or coloured cotton wrappers; one was a cadaverous-looking old man, the other an evil-favoured but well-meaning old woman. It was easy to recognise from the mop of frizzy hair worn by the woman and her dark skin that she was an "orang pangan utan," literally in Malay a jungle dweller, belonging to the Semang tribe, and, as both were clad in sarongs in place of their customary apron of leaves or girdle of bark, it might be surmised that they had been in close contact with the Malays. The old woman, who was evidently a "tame Sakai," spoke Malay fairly fluently, and could be drawn into a conversation, but the man, who bore the marks of privation and disease, could not be prevailed upon to take any part in it. He only gave a guttural grunt occasionally, and shivered with ague from time to time as he crouched on the seat of the boat in the attitude known in Malay as "melengong," literally to sit on the ground wrapped in thought.

At noon we turned sharply, headed for the mouth of the Serasa River (a small jungle stream with a grateful canopy of greenwood shade), and poled up it for some distance until we met a stalwart, dark-skinned, curly headed young Pangan, who was felling bamboos on the river bank. A weird-sounding conversation ensued between him and the old woman, and the boy was evidently directed to announce our arrival. He disappeared into the jungle, while we proceeded to pole up stream more leisurely, until we finally landed near the trunk of a fallen tree in the depth of the forest. A rather tedious climb brought us to the top of a hill, and after groping for some way along an old jungle game track, almost entirely hidden by undergrowth, our friends warned us that we were nearing their village; this was so well hidden that, in spite of the warning, we were taken by surprise when we suddenly stepped into it. The village was merely a small, roughly cleared space at the foot of some giant trees, with about seven or eight rickety lean-to booths carelessly erected on the ground, roofed, floored, and partially inclosed with brushwood and jungle palm leaves. The whole aspect was squalid, desolate, and dirty. About thirty men, women, and children clustered together and jabbered to one another on my approach, while a little brown dwarf with a hideous deformity of the spine, who had been left unsupported near a smouldering fire, wailed in terror as if confronted by some fearful ghoul or foreign devil. Most of the people in this primitive village were as tall as but perhaps more comely than the average brown-skinned Kelantan Malay. In colour they were a decidedly dusky brown, but did not approach a sooty black; the hair of the younger men was crisp and curly, but that of the women frizzly, although not compact like astrakan. Both sexes had fine, bright, forward-bearing brown eyes. These features, with large hands and comparatively straight noses, suggested a Papuan origin similar to the Andamanese, but there were also points suggestive of the negro. Many—indeed, the majority of them—were suffering severely from malarial fever and from loathsome forms of skin disease. Among these were examples of a disease called yaws, indigenous to Africa; it has been conveyed to the West Indies by negro slaves, and perhaps has been introduced to Malaya in the same way. A few English medicines were soon disposed of, and some presents (red cloth, tobacco, cheap mirrors, and the like) were accepted and evidently highly prized. The sobs of the distracted little hunchback eventually gave way to the delight and novelty of puffing a cheap cigarette, and the distribution of a boxful of them further helped to relieve the tension; but there was a general move towards the jungle when I produced my camera, which was mistaken for a kind of gun. The photographs taken on this occasion were not very successful, but others taken in Kelantan under similar conditions serve equally well as illustrations. The next day the jungle folk had struck their camp and had gone farther inland. They seldom stay for any length of time in one place



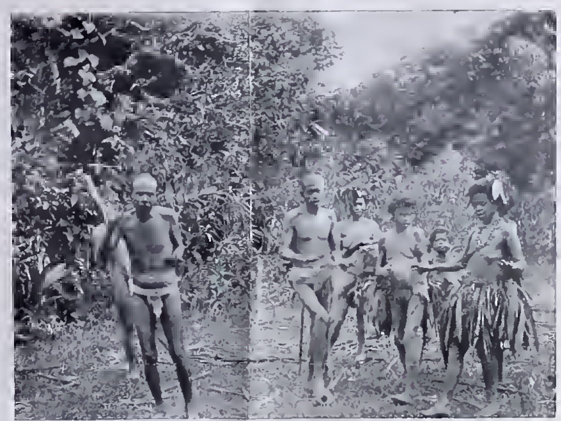
[Phot: R. Pertot.

Sakai Chief Shooting with Blowpipe.



[Phot: R. Pertot.

Shooting with Blowpipe—Another Attitude.



Phot: R. Pertot.

A Sakai Dance.

Shortly afterwards some Sakai appeared at the house of the Toh Kuen, or local Malay chief, with some fruit, resin, and rattans to barter for rice and salt, and it was easy to arrange for another visit to their camp. This time a small party of us, including the toh kuen, the pawang, or witch doctor of the village, two of my men, and two other Malays, started shortly after sunrise to walk through the jungle to the camp. The pawang knew the way, and it was reassuring to have him with us; these men are generally intelligent, handy individuals, who get much of their knowledge regarding herbs, native medicines, and woodcraft from the dwellers in the jungle. Our pawang, an old, white-haired, active little brown man, led the way, and was the first to point out the recent tracks of a tiger, to scent some wildpig, and to put up a clattering jungle fowl. After two hours of wading in and out of small streams, clambering up hills, slipping, sliding, and scrambling through the evergreen Malay jungle, we finally reached "bukit lehah" (literally the breathless hill), and found a small, empty Sakai camp. Like the Semang village at Serasa, it merely consisted of a few temporary and very crazy lean-to shelters, but in this case the floors were made of thin sticks placed horizontally and parallel, and raised about 6in. from the ground. They had just been built by the women folk, whose exclusive duty it is to erect them, and were only slightly raised from the ground, so that they who watched by night could hear clearly and smell the approach of wild animals. The Sakai possess in general great acuteness of the external senses, which in their unsettled life they are constantly called on to exercise from early childhood. The perfection which they attain, as well as their capability of enduring continued exertion on long journeys, seems to be simply the result of early training. They generally find sufficient subsistence in the jungle, and lead on the whole a peaceful existence. The Malays said that the wild men go out and disperse in the jungle daily at sunrise, with blowpipes and darts, to shoot birds, monkeys, wild pig, and small game, such as the mouse deer, on which they feed after roasting the flesh; they also collect frogs and snakes, a few nourishing fruits, a few salutary roots, and thus supply their most immediate wants. They reassemble and return to their camp at sunset, when fires are kindled either by flint and steel or by the cross friction of two pieces of dry bamboo. They neither rob nor steal, but are said to cheat and to have no form of worship. The marriage ceremony is very simple, and consists in plighting troth before their chief, who inquires if the man is sufficiently armed, and on the bridegroom satisfying the chief that he possesses a blow pipe, a flint, and some form of iron chopper, nothing further is necessary, except (among the Semang) that he has to chase his intended bride round a tree until he succeeds in catching her.

As I have said, on the occasion of my second visit to the Sakai we reached their camp to find it empty, but a series of howls by the pawang at last brought a response from someone, who had apparently been hiding near by. This proved to be the chief, who eventually succeeded in persuading the rest of his people to assemble; they were a family party of six or seven men, with their wives and children These people were Semang, similar in appearance to the aborigines at Serasa, but more healthy, of much better physique, and less timid; they were clothed like the rustic Malay, and most of the men, following the example of "tame Sakai," who imitate Malay customs, had shaved their heads. The chief good naturedly gave us an exhibition of shooting with a blowpipe. He shot at a target with pellets of hardened resin. All the tribes are very proficient with this weapon, which consists of a hollow bamboo about 7ft. or 8ft. in length and about ½in. in diameter, perfectly straight, and furnished with an inner lining of bamboo and a small wooden cup as a mouthpiece. Many of the blowpipes are decorated with patterns in carving. Poisoned darts or balls of clay are propelled from them by means of the breath and the help of a bit of pith. Some of the other tribes use a primitive bow and arrow in addition to the blowpipe. This is a powerful weapon, with a shaft made of iron wood about 2 yards in length and 2in. in breadth at the widest part, and a string made of twisted bark about ¼in. thick. The arrows are either wholly of wood, spear shaped, with a blade of 4in. and length of shaft about 3ft., or tipped with a rough barbed piece of iron. The poisoned wounds of five arrows from a bow are said to be sufficient to kill an elephant. The darts and arrows are generally made from the stem of the bertam palm (*Eugeissona tristis*) and dipped for nearly an inch in ipoh poison. This is obtained from the ipoh or upas tree (*Antiaris toxicaria*) by making an incision in the trunk, collecting the juice, and (it is said) mixing various other poisonous ingredients, such as the poison glands of snakes, white arsenic, and putrid offal. The result is a black, sticky substance, and the effect on man is said to be very rapid and fatal. The only antidote known to the Malays is to eat a mouthful of earth immediately after receiving a wound. The toh kuen considered this to be a sovereign remedy, but the pawang did not care to express an opinion.

The awe which had been inspired by our visit was now beginning to wear off, and after a good deal of persuasion we induced some of the Semang to dance. The Kelantan jungle folk are noted for their dancing, but their singing is held to be inferior to the Malay singing. The improvised nautch, which was finally got up for our benefit, was a very simple affair. The band was quickly provided from the jungle by cutting two pieces of green bamboo, each about 2ft. in length and 6in. in diameter. A child manipulated them, and by striking the ends alternately against the root of a tree produced an excellent imitation of the sound of a Malay native drum. The chief performers were three girls, who commenced shyly with a series of slow movements of their hands and bodies, and then, gradually gaining more assurance, began to sing in a plaintive, monotonous chant, which grew quicker, until it became a melody, to which they moved in and out and danced with unrestrained grace, as if to the measure of a simple minuet. Even the habitually serious and ironical expression of the toh kuen softened at the sight of this artless impromptu entertainment, at the conclusion of which we left the camp.

These poor outcasts of civilisation and society had danced for us in the heat of the day, and I could not help thinking, as we returned gravely to the civilisation of our headquarters, how fascinating their performance would have been if held on some chosen sward by the silvery light of an Eastern moon, instead of on a roughly cleared space under the perpendicular rays of a tropical sun.

John D. Gimlette.